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R. H. STINCHFIELD, *Editor*

*Editorial Office:* 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXIV NO. 7

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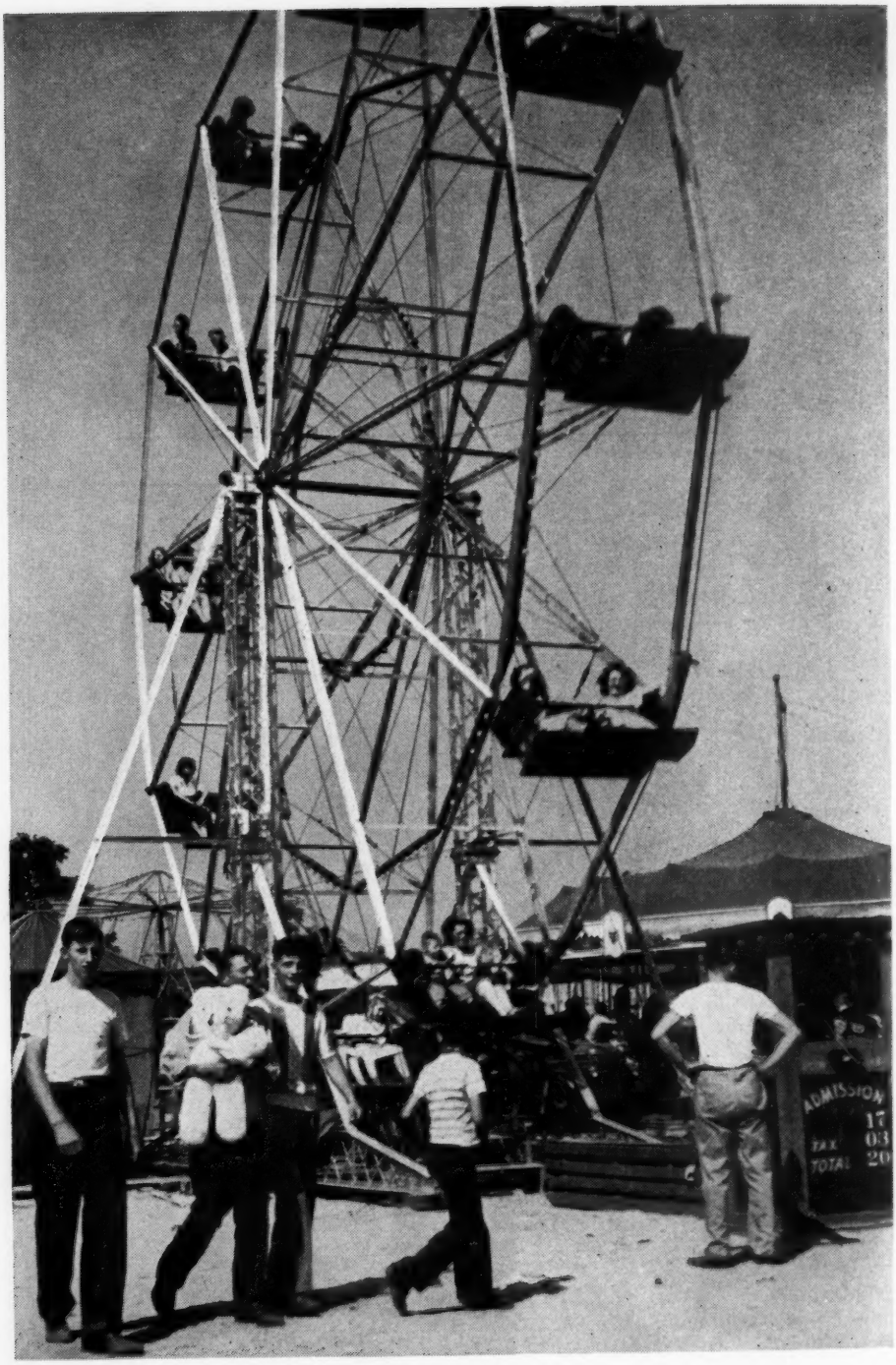


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**Remember It's . . .**

# Our America

Jeff McDermid

HARDLY any of us native Americans or naturalized citizens rely upon high-toned professional oratory or official orders and controls to stimulate our fervid fund of admiration and devotion to this Republic. Neither are we dependent solely upon the potency of published books and pamphlets or radio dramas respecting the ideals and achievements of the past and the critical urgency of the present and the future. Few of us have been totally blind and indifferent to public affairs or so concerned with making a living as to forget the real basis upon which our success, welfare, and happiness rest.

What is it that has really given us a deep-rooted feeling of pride for our country when acting in the right as it squares with ethical principles, and a contrary sense of personal regret when defense seems to lag and justice is flouted and defeated? If you imagine we don't have such feelings, you've been a hermit rather than a mingler and an observer of the American scene.

If you ask me why, I'll tell you the reason: It's just a family custom, an inbred habit, a treasured tradition. It operates alike for the "old-line" original families, as well as for the families more recently becoming adopted citizens hereabouts. It's not a dictated goose-stepping forced show of ardent nationalism. Our patriotism—if I may use this much-frayed word—is not

cruelly branded on our unwilling and shrinking hides. It is bred in the bone and nursed in the marrow. It has little to do with finance or capitalism or trade or commerce or learning or science or power or invention, to each of which it contributes; but it derives its strength from the intangible realms of the spirit and the soul.

You can prove this by studying almost any "family tree" growing in your neighborhood. These trees grew up in the American soil and most of them have thrived on it, or are at least better off here than they might have been elsewhere.

MY wife's grandfather and my own father were born within about 60 years after the birth of the United States as the Thirteen Colonies. We ourselves were born hardly more than one hundred years after the first president took the oath of office. In our two merged family trees flow the sap of English, Scotch, Irish, German, French, and Alsatian lineage — all grafted finally on the American rootstock and bearing their fair share of blossoms and fruits, as well as having off-periods of barren years and failures. Yet we do not blame the soil entirely for the latter.

Our kids with those six strains combined married in their turn and thereby acquired sap from the Scandinavian peninsula and some hybrid Yankee mixtures of several sorts too numerous to guess at, from whence new shoots will spring from the American earth in years to come.

Let's take a look at my wife's grandpa and grandma, both green rural immigrants from Bavaria, who arrived in the wave of overseas urgency which followed the revolutions and uprisings and unrest of 1848 in Europe. Aside from their church devotions, which do not matter as to creed, their main motive for risking all they had or hoped to be by sailing a voyage of two months in angry seas was to get their tree roots into a free soil. Young, unacquainted with the language or the land, strong and eager for the test of the life ahead, these fine young patriots of progress settled in a German community in a Midwest state. They arrived here in steerage amid cooking pots, family washings, crying infants, and hopeful companions. They put their trust in the times and found opportunity to learn and labor as hired hands for German rustics only a score of years ahead of them in this adopted country.

From the start these immigrant kids had trials and tribulations that only cemented them more firmly to the new country. Sickness, long and hard tasks to do at not much above "board and keep," and finally in less than ten years a war broke out.

Now this same war likewise involved the lives and fortunes of thousands of rustics in another region south of them. In that remote area, too, there were a few fresh immigrants, although the most were just about as close to "original" white stock as you could locate anywhere. Enough to say, that this struggle proved in the last analysis to be one that ended in mutual respect on both sides, wherein the loss and the sorrow and the pain came through like a bright rainbow after a summer storm —assuring a kind of bond and unity which comes to all who suffer together for what each thinks is right.

Right here I thread on another sprig from the family tree. My own father became a raw recruit, too, and marched with the banner of the same state as did my wife's immigrant grandpa. They never met or knew of each other's existence, but they shouldered arms and left the small farms for four years and lived to attend reunions and clasp the strong hands of the boys in gray when the glories of both armies blended into the greater traditions of America.

THERE was not much difference between these two northern soldier lads, except that one was a "Dutchman" and the other happened to be born in Polk's administration in a tiny Vermont

hamlet where his Dad was a blacksmith. His family had rooted its shrub in New England soil shortly after the original Puritans, but confidentially they were far from Puritans—being rough-and-ready, adventure-seeking, and restless to go West and beyond. So lo and behold! My father's folks

and that brave Bavarian crew arrived in the Midwest in almost the same exact year, to neighbor with the "Injuns" and set traps and plow sod and try out the new fangled reapers.

After the War of the Sixties, things began to hum and take up speed in this new and raw America, especially in the North and West. Yet while many of the transplanted rustics of the Midwest followed the wagon trains and made campfires along the Oregon Trail, a larger number—among them our two sprigs—remained in the state where they had cast their fortunes, to branch out and grow their family trees.

For a good while these boys and their sons were busy building a new country—too intent upon what tasks their hands might perform to notice that the country they had adopted was itself growing into a mighty huge and deep-rooted tree itself. By dint of all the good stock it had absorbed and the fresh fertility of the soil and the big things that called out for an answer and the challenge to men's enterprise—because of these changes, America was outgrowing its short pants, sometimes feeling "too big for its breeches."

It wasn't very long before the older countries began to notice how strong this America was becoming, getting so much of its adolescent vim from the best sap that the foreign forests provided. It stood up proudly for the Monroe Doctrine and fought a war with Spain, and later became the peacemaker for older warring nations. In those formative proving years of America as witnessed by our two relatives (now middle-aged men) there was a mysterious force alive and at work, which was just a symbol of the attitude that stirred the discoverers and the refugees from tyranny. That symbol was the dignity of man and the right to live in free self-government.

But other things were soon added. America developed mammoth and unbelievable resources of power and mechanical might, which came naturally in a land open to imagination and enterprise. The tools and the methods of farming changed for our two citizens and their kinfolk. The German grandpa shifted over into a growing line of urban industry and succeeded on his merit—a fair day's work and a fair day's pay for well-treated workmen. The Yankee that was my father was never so prosperous, staying on the farm.

Those were pretty fine years—back at the time my wife and I arrived as buds on the family tree and started out to flutter and grow in the sunshine of security. Except for that Spanish affair in Cuba and the Philippines, America had not emerged as yet into the full flower of international importance.

LIFE in town and country was sort of slow, peaceful, and live-and-let-live. Expenses were not high and incomes were modest to match them. Relatively few tried to "keep up with the Joneses." The height of fashion was the buggy with the fringe on top,

(*Turn to page* 40)

# Alfalfa—Its Mineral Requirements and Chemical Composition*

*By Firman E. Bear and Arthur Wallace*

Soils Department, Agricultural Experiment Station, New Brunswick, New Jersey

AFTER some years of study of alfalfa in relation to the ratios of exchangeable cations in the soil on which it is growing, an ideal soil was suggested. The exchange complex of this soil contains about 65 per cent Ca, 10 per cent Mg, 5 per cent K, and 20 per cent H, expressed as milliequivalents. The pH of such a soil would be approximately 6.5. If the cation-exchange capacity were 10, there would be 6.5 me. exchangeable Ca, 1.0 me. exchangeable Mg, 0.5 me. exchangeable K, and 2.0 me. exchangeable H per 100 gm. dry soil. These values correspond to about 2,600 pounds Ca, 245 pounds Mg, and 390 pounds K per 2 million pounds soil, the approximate weight of the plowed acre.

An ideal soil yielded alfalfa which, at the early blossom stage, contained 2 per cent K, an almost ideal value. Such a plant should contain about 1.40 per cent Ca and 0.35 per cent Mg. It should also contain about 3 per cent N (18.75 per cent protein), 0.27 per cent P, and 0.20 per cent S. These values can be used to advantage in determining the nutrient levels at which alfalfa should be maintained.

The cation milliequivalent sum of alfalfa from 31 locations in New Jersey varied between 100 and 200[5]. The mean was 141. The mean of the anions was 255. These values are considerably lower than those obtained for alfalfa growing in the best nutrient solutions. Yields increased in solution culture up to 3 per cent K in the alfalfa. Decreasing the concentration of the nutrients, but leaving the salts in the same proportions as those present in the standard culture solution, resulted in alfalfa that contained cation and anion milliequivalent sums similar to those of field-grown alfalfa, but the yield was greatly reduced.

### Nutrient-element Balance Important Factor

The equivalent sum of the K, Ca, Mg, and Na in alfalfa, for a particular cutting, tends to be a constant under uniform environmental conditions, except as to the nutrient supply. An increase or decrease in one of these cations results in equivalent increases or decreases in the others. K, an expensive element, tends to replace Ca and Mg, which are not only much less costly but much more likely to be deficient in livestock feeding.

The equivalent sums of N, P, S, Cl, and Si for any given cutting, expressed as anions, are as constant as those of the cations. Interrelationships similar to those of the cations have been noted for the $NO_3$, $H_2PO_4$, $SO_4$, Cl, and $SiO_3$ anions. Finally, the ratio between the cations and anions in alfalfa tends to be constant for all cuttings. In the field experiment, this ratio tended to be about 0.54.

This general relationship of cations and anions was found to apply to a wide variety of plants. Those that were low or high in cations were correspondingly low or high in anions. According to present knowledge, the best expression for the cation-anion relationship in

* The last installment of a reprint of New Jersey Agricultural Experiment Station Bulletin 748, January 1950.

[5] All milliequivalent values are per 100 gm. dry matter, whether of soils or plants.

plants at any given pH value is as follows:

$$\frac{K + Ca + Mg + Na}{N + S + P + Cl + Si} = \text{constant}^6$$

A change in the supply of any one cation induces a change in the uptake of all the other cations in a plant. The same is true for any one anion. If the total cation content of the plant increases, that of the anions rises accordingly. Elements like Na and Cl have important influences in this connection. There are limits to the absorption of any one element, but within these limits, substitutions of great importance may be effected.

### Critical Nutrient Levels for Plants and Soils

A critical nutrient level is defined as an intermediate point between poverty adjustment and luxury consumption. In poverty adjustment, increasing yields are obtained in proportion as the limiting factor is supplied. In luxury consumption, an excessive accumulation of nutrient elements occurs beyond the plant's need for them, but without reduction in yield. The critical level is the optimum level for any nutrient element below which a yield response is to be expected and above which yields will not increase. The critical levels in plants vary, and the optimum must be redefined for each set of conditions of growth. Limiting factors, whether in the form of deficiencies or toxicities, are unavoidably multiple, overlapping, and interacting. Overcoming any one limiting factor in the growth of plants may not result in increased growth if other limiting factors are also operating.

On the basis of the studies reported in this publication, it is possible to set down approximate critical levels for the several nutrient elements, both for the alfalfa plant and for the soil on which it is growing. For the plant, the critical level for K is about 1.4 per cent; for Mg, about 0.24 per cent; for P, about 0.27 per cent; for Mn, about 10 ppm.; and for B, about 20 ppm. For the soil, the pH value should not fall below about 6.5; exchangeable K, below 80 pounds in the plowed acre; and water-soluble B, below 0.35 ppm.

### Feeding Value of Alfalfa Can Be Improved

Alfalfa occupies a leading position among forage crops. A large proportion of the factors considered essential in nutrition are concentrated in its leaves, and harvesting and feeding procedures with this crop should be such as to make the most of the leaves.

Alfalfa has lower feeding value in summer than in spring or fall. This is correlated with low protein and phosphorus in the forage. Plants grown in midsummer contain relatively high amounts of fiber, which dilute the mineral, vitamin, and protein portions. The feeding value of summer forages can be improved by use of fertilizers, by use of mixed plant species, and by supplemental irrigation.

High-K plants tend to be low in Ca and in protein. But they contain less lignin and they have higher concentrations of vitamins than do low-K plants. Ca is more important quantitatively to animals than is K. The critical level of Ca in forage for milking cows has been set at 0.35 per cent. Fortunately it never falls below this level in alfalfa. But the cost of Ca in the form of $CaCO_3$ is only about one-twentieth that of an equivalent amount of K in fertilizer form. Consequently, it would seem advisable to make the conditions in the soil such that the alfalfa is able to take up as much Ca as it can use to advantage.

The percentage ash in alfalfa increases with the K content of the plant. This is because the equivalent weight of K is higher than that of Ca or Mg. Thus the percentage ash alone cannot be used as a criterion of the mineral feeding value of the alfalfa. The composition of the ash must be known.

Co is of importance in feeding live-

[6] Other cation and anion elements are usually present in too small amounts to influence the results.

TABLE XIII.—INFLUENCE OF K AND B ON ORGANIC COMPOSITION OF ALFALFA.

| Treatment | Ether Extract | Alcohol Extract | Fiber | | Ash | Crude Protein | Starch and Hemi-Cellulose | Total | Leaf to Whole Plant |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lignin-like | Cellulose | | | | | |
| *ppm.* | % | % | % | % | % | % | % | % | % |
| *Culture-solution samples* | | | | | | | | | |
| 0.001 B | 2.2 | 20.1 | 8.2 | 22.5 | 10.5 | 26.1 | 11.6 | 101.2 | 52.3 |
| 0.5 B | 2.4 | 20.0 | 8.1 | 24.6 | 10.1 | 25.0 | 11.1 | 101.3 | 47.0 |
| 5.0 B | 2.2 | 21.3 | 7.4 | 23.8 | 11.0 | 25.4 | 10.5 | 101.6 | 46.2 |
| 10.0 K | 2.2 | 19.0 | 9.3 | 24.1 | 8.1 | 25.1 | 12.8 | 100.6 | 49.0 |
| 195.0 K | 2.2 | 21.6 | 6.6 | 23.6 | 11.7 | 25.7 | 10.6 | 102.0 | 48.3 |
| 468.0 K | 2.4 | 20.8 | 7.8 | 23.3 | 11.9 | 25.6 | 9.9 | 101.7 | 48.1 |
| *Field samples* | | | | | | | | | |
| Low K* | 2.0 | 15.9 | 11.4 | 23.8 | 5.8 | 17.5 | 22.5 | 98.9 | 60.8 |
| Normal K* | 1.6 | 18.1 | 12.2 | 25.3 | 6.4 | 15.3 | 20.1 | 99.0 | 42.2 |

* Field samples from second cutting, 1948. Low-K sample contained 0.55 per cent K and normal-K sample 1.63 per cent.

stock. Some forages are too low in this element for safe feeding. A value of 0.07 ppm. has been given as a minimum. An application of 5 pounds of cobalt nitrate [$Co(NO_3)_2$] per acre increased the Co content of the alfalfa from 0.07 to 0.50 ppm.

Proximate analyses were made of eight samples of alfalfa, six of which were obtained from plants grown in culture solutions and the other two from field-grown alfalfa (Table XIII). The samples were extracted with ether for "ether extract." The residue was extracted with 80 per cent alcohol ($C_2H_5OH$) for the "alcohol extract," a correction being made for the ash. A portion of the residue from the

TABLE XIV.—INFLUENCE OF K DEFICIENCY ON LEAF PERCENTAGE AND ON CHLOROPHYLL, CAROTENE, AND RIBOFLAVIN IN RANGER ALFALFA.

| Deficiency | Plot | Leaves | Chlorophyll | Carotene | Riboflavin |
|---|---|---|---|---|---|
| June 7, 1948 | | % | % | *ppm.* | *ppm.* |
| Severe | 23 | 53.6 | 0.83 | 159 | 6.1 |
| Moderate | 4 | 47.2 | 1.06 | 227 | 9.9 |
| None | 8 | 45.0 | 1.12 | 252 | 13.0 |
| July 12, 1948 | | | | | |
| Severe | 23 | 61.7 | 0.82 | 162 | 14.0 |
| Moderate | 4 | 44.4 | 0.92 | 178 | 16.4 |
| None | 8 | 45.6 | 0.95 | 187 | 16.6 |
| August 23, 1948 | | | | | |
| Severe | 23 | 61.5 | 0.82 | 160 | 7.2 |
| Moderate | 4 | 57.4 | 0.94 | 257 | 13.2 |
| None | 8 | 50.2 | 0.94 | 257 | 11.4 |

TABLE XV.—VARIETY, STAGE OF BLOOM, AND HARVESTING DATES OF SECOND-CUTTING ALFALFA IN 11 STATES FROM WHICH SAMPLES WERE COLLECTED, AND SOIL SERIES ON WHICH THEY WERE GROWN.

| State | Soil Series* | Alfalfa Variety | Bloom Stage | Cutting Date 1947 |
|---|---|---|---|---|
| California | Yolo (a) | Ranger | ¼ | May 30 |
| Minnesota | Waukegan (b) | Ladak | ¼ | Aug. 26 |
| New York | Dunkirk (c) | Ranger | ⅓ | Aug. 27 |
| Wisconsin | Miami (b) | Ranger | ¼ | Aug. 13 |
| Utah | Salt Lake (c) | Ranger | 1/10 | July 28 |
| New Jersey | Nixon (d) | Ranger | 1/10 | July 18 |
| Kansas | Wabash (b) | Buffalo | 1/10 | July 29 |
| Colorado | Fort Collins (e) | Hardistan | 1/10 | July 18 |
| Michigan | ..... (f) | Ranger | ¼ | Aug. 21 |
| Oklahoma | Yahola (a) | Ranger | 1/10 | June 27 |
| Nebraska | Wabash (c) | Ranger | 1/5 | July 31 |

* (a) = fine sandy loam, (b) = silt loam, (c) = silty clay loam, (d) = loam, (e) = sandy silt loam, and (f) = sandy clay loam.

alcohol extraction was hydrolyzed with 80 per cent sulfuric acid ($H_2SO_4$), leaving the lignin-like materials. A correction was made for ash and protein. Another portion of the residue was hydrolized with 2 per cent hydrochloric acid (HCl), leaving the cellulose-like materials. A correction was again made for ash and protein. The HCl-soluble portion, minus ash and protein, constitutes the starch and hemicellulose fraction. Ash and protein were determined in the usual manner.

The ether extract was in no way related to the mineral content of the plant. It was lower in the field-grown samples than in those grown with nutrient solutions. The alcohol extract, which includes sugars, dextrins, and some fat-like materials, tended to increase with increasing K.

K-deficient field alfalfa, which had 60 per cent leaves, contained 11.4 per cent lignin, whereas normal field alfalfa, with only 42 per cent leaves, contained 12.2 per cent lignin.

Crude protein tended to be much lower in field-grown alfalfa than in that grown with nutrient solutions. It tended to be slightly higher in K-defi-

TABLE XVI.—CATION, ANION, AND ASH CONTENT OF ALFALFA COLLECTED FROM 11 STATES AND CATION-ANION RATIOS.

| State | Cations* | | | | | Anions* | | | | | Cation Anion Ratio | Ash |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | K | Ca | Mg | Na | Sum | N | P | S | Cl | Sum | | |
| | *me.* | *me.* | *me.* | *me.* | *me.* | *me.* | *me.* | *me.* | *me.* | *me.* | | % |
| California | 39 | 64 | 85 | 6 | 194 | 210 | 7 | 17 | 29 | 263 | .73 | 6.6 |
| Minnesota | 32 | 106 | 46 | 2 | 186 | 229 | 8 | 20 | 9 | 266 | .71 | 7.9 |
| New York | 36 | 83 | 26 | 3 | 148 | 206 | 10 | 14 | 11 | 241 | .62 | 7.1 |
| Wisconsin | 30 | 83 | 46 | 3 | 162 | 200 | 10 | 25 | 15 | 250 | .65 | 6.4 |
| Utah | 62 | 75 | 23 | 1 | 161 | 193 | 7 | 19 | 14 | 233 | .78 | 5.7 |
| New Jersey | 32 | 62 | 22 | 1 | 117 | 158 | 7 | 17 | 12 | 194 | .60 | 5.7 |
| Kansas | 44 | 94 | 24 | 3 | 165 | 192 | 8 | 17 | 8 | 225 | .73 | 7.3 |
| Colorado | 59 | 76 | 22 | 2 | 159 | 200 | 8 | 15 | 19 | 242 | .66 | 7.8 |
| Michigan | 16 | 108 | 45 | 1 | 170 | 188 | 5 | 19 | 7 | 219 | .79 | 7.9 |
| Oklahoma | 34 | 87 | 33 | 1 | 155 | 237 | 8 | 24 | 5 | 274 | .55 | 6.2 |
| Nebraska | 62 | 67 | 17 | 2 | 148 | 183 | 8 | 12 | 9 | 212 | .69 | 9.0 |

* See footnote 4 for factors to translate me. values into percentages.

cient than in normal plants. Alfalfa that was low in K contained higher percentages of starch and hemicellulose-like material.

Alfalfa grown with nutrient solutions contained higher percentages of both total and nonprotein N than did field alfalfa. Deficient plants, especially those low in B, tended to contain larger percentages of nonprotein N.

More than 80 per cent of the carotene and riboflavin in Ranger alfalfa (Table XIV) was in the leaves. Variations in leaf percentage, either those occurring naturally or resulting from defoliation, were an important factor in the vitamin content. Slight deficiencies of nutrient elements had little influence, but severe deficiencies, resulting in abnormal foliage discoloration, were associated with vitamin decreases. In spite of increased leaf percentage, extremely deficient plants were stunted and had a low vitamin content. A higher riboflavin content was found in the second cutting than in the first and third, but the reverse was true for carotene.

### Alfalfa from 10 States Analyzed

Samples of alfalfa were collected from 10 important producing states (Table XV), and their composition was compared with that of New Jersey alfalfa (Table XVI). Seven of the samples were of the Ranger variety and the remaining three of the Buffalo, Hardistan, and Ladak varieties. All represented the second cutting.

Soil samples were obtained from the fields in which the alfalfa had been grown (Table XVII). The soils from Colorado and Utah contained considerable free lime. The pH values of the soils from the midwestern states were relatively low, but acidity may not be so critical in these states as in New Jersey, since the soils have higher cation-exchange capacities and usually overlie calcareous subsoils. The exchangeable K content of most of the out-of-state soils was higher than that of New Jersey soils, with the exception of one sample from Michigan. The available P contents were higher in the out-of-state soils. No correlation existed between the available soil P and the P content of the alfalfa. There was no consistent relationship between the water-soluble B of the soil and the B content of the plants.

The critical level for K in the field alfalfa has been set at about 35 me. per 100 gm., or 1.4 per cent. The samples obtained from east of the Mississippi

TABLE XVII.—pH, EXCHANGEABLE K, AVAILABLE P, AND WATER-SOLUBLE B IN SOILS COLLECTED WITH ALFALFA SAMPLES FROM 11 STATES.

| State | pH | | Exchangeable K | | Available P | | Water-Soluble B | |
|---|---|---|---|---|---|---|---|---|
| | Soil | Subsoil | Soil | Subsoil | Soil | Subsoil | Soil | Subsoil |
| | | | *me.** | *me.** | *lb.*† | *lb.*† | *ppm.* | *ppm.* |
| California | 7.8 | 7.8 | .46 | .34 | 32 | 33 | 0.75 | 0.75 |
| Minnesota | 5.6 | 6.3 | .21 | .33 | 24 | 10 | 1.25 | ..... |
| New York | 6.2 | 5.5 | .19 | .12 | 15 | 10 | 0.85 | 0.35 |
| Wisconsin | 6.3 | 5.7 | .26 | .35 | 26 | 9 | 0.35 | 0.25 |
| Utah | 7.2 | 7.5 | 1.53 | .96 | 43 | 38 | 0.45 | 0.35 |
| New Jersey | 6.6 | 7.0 | .18 | .26 | 12 | 12 | 0.50 | ..... |
| Kansas | 5.8 | 5.6 | .46 | .35 | 26 | 22 | 0.75 | 0.35 |
| Colorado | 7.3 | 7.3 | .91 | .43 | 39 | 24 | 1.05 | 1.05 |
| Michigan | 6.6 | 6.3 | .14 | .17 | 19 | 20 | 0.65 | 0.65 |
| Oklahoma | 5.8 | 5.7 | .21 | .22 | 26 | 16 | 0.65 | 0.55 |
| Nebraska | 5.3 | 5.6 | .81 | .48 | 19 | 19 | 0.75 | 0.75 |

* Per 100 gm. dry soil or subsoil. To translate me. values into pounds per plowed acre, m by 780.
† Per acre to plow depth.

TABLE XVIII.—MINOR-ELEMENT CONTENT OF ALFALFA FROM 11 STATES.

| | B | Fe | Mn | Mo | Cu | Co | Zn | Relative Concentrations* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Al | Cr | Pb | Ni | Sr | V |
| | *ppm.* | *ppm.* | *ppm.* | *ppm.* | *ppm.* | *ppm.* | *ppm.* | | | | | | |
| ***Out-of-state samples*** | | | | | | | | | | | | | |
| *State* | | | | | | | | | | | | | |
| California | 60 | 186 | 16 | 1.1 | 14 | 0.17 | 26 | M | M | S | S | S | 0 |
| Minnesota | 52 | 125 | 39 | 0.4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| New York | 28 | 320 | 26 | 0.4 | ..... | 0.21 | 49 | M | S | S | S | S | 0 |
| Wisconsin | 32 | 110 | 32 | 0.3 | 18 | 0.04 | 41 | M | M | S | S | S | 0 |
| Utah | 56 | 117 | 19 | 1.0 | 13 | 0.12 | 13 | M | M | 0 | S | S | 0 |
| Kansas | 68 | 122 | 30 | 1.7 | 23 | 0.02 | 21 | M | S | 0 | S | L | 0 |
| Colorado | 60 | 187 | 10 | 2.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Michigan | 24 | 204 | 20 | 4.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Oklahoma | 44 | 136 | 30 | 1.3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Nebraska | 46 | 152 | 26 | 0.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ***New Jersey samples*** | | | | | | | | | | | | | |
| *Soil Series* | | | | | | | | | | | | | |
| Collington | 63 | 675 | 14 | 2.1 | 23 | 0.07 | 20 | M | S | S | S | S | 0 |
| Washington | 18 | 260 | 48 | 2.0 | 27 | 0.14 | 24 | M | S | S | S | S | 0 |
| Hunterdon | 33 | 190 | 43 | 0.1 | 31 | 0.16 | ..... | M | S | S | S | S | 0 |
| Keyport | 48 | 112 | 34 | 0.2 | 44 | 0.24 | 23 | S | S | S | S | S | 0 |
| Copake | 63 | 164 | 33 | 4.6 | 31 | 0.15 | 15 | M | S | S | S | S | 0 |
| *Harvest*† | | | | | | | | | | | | | |
| 1946 | 36 | 160 | 21 | 0.8 | 24 | 0.12 | 58 | M | S | S | S | S | S |
| 1947 | 38 | 155 | 31 | 0.7 | 61 | 0.08 | 33 | M | S | S | S | S | 0 |
| 1948 | 53 | 149 | 35 | 0.5 | ..... | 0.07 | ..... | M | S | S | S | S | S |
| *Plant Parts* | | | | | | | | | | | | | |
| Leaves | ..... | ..... | ..... | 0.7 | 22 | 0.05 | 28 | M | S | S | S | S | S |
| Stems | ..... | ..... | ..... | 0.4 | ..... | 0.09 | ..... | M | S | S | S | S | S |
| Leaves and stems‡ | ..... | ..... | ..... | 0.2 | 25 | 0.07 | 24 | S | S | S | S | S | 0 |

* L = large, M = medium, S = small, and 0 = absent. These samples were also examined for Sb, As, Ba, Be, Cd, Ce, Ga, Ge, Au, Ag, Li, Hg, Pt, Ra, Rh, Ru, Se, Te, Tl, Th, Sn, and U. None of these elements were found.
† Samples chosen from same plots and same cuttings for 3 successive years.
‡ Plants grown in sand culture.

River were near this limit. Those from west of the Mississippi were considerably higher, except for the sample from Oklahoma. The K content of alfalfa from states where this crop persists for a number of years was between 1.5 and 2.5 per cent.

Michigan, Wisconsin, and Minnesota have about 3 million acres of alfalfa, or more than 20 per cent of the entire acreage in the United States. The samples from these states contained the lowest amounts of K of all those examined. The K content of the samples from Michigan was considerably below the critical level, and the P content of these samples was seriously low.

The B content of all alfalfa samples was above the critical level. The samples from the western states contained three to four times the suggested 20 ppm. water-soluble B, but those from the eastern states were just over the critical level. This indicates that many eastern soils are potentially B-deficient.

The minor-element content of alfalfa grown in other states was compared with that from New Jersey (Table XVIII). Some of the minor elements were determined by colorimetric procedures and others by the use of the spectrograph. Other than B, Fe, Mn, and Mo, there were no indications that the minor elements are of major importance in the culture of alfalfa.

Analyses of samples representing 3 consecutive years of growth from the field-plot experiment at New Brunswick indicated increasing B and Mn and decreasing Mo and Zn contents year by year, and the same applied to Co. The samples from New Jersey were the only ones containing vanadium (V). Cu and Zn appeared to be lower in plants from soils of the west that were high in lime. Small quantities of nickel (Ni), strontium (Sr), and lead (Pb), were indicated for most samples.

### Summary and Conclusions

Alfalfa is growing in popularity in the eastern and southern states.

Lack of fertility is largely responsible for the failure or short life of this plant in New Jersey.

A field experiment, covering a 4-year period and involving a considerable number of variations in fertilizer topdressings, was undertaken to study the requirements of this important crop.

The test was conducted on Nixon loam, which is closely related to Sassafras loam but overlies red shale.

The land received 1½ tons pulverized calcitic limestone and 600 pounds of a 5-10-10 grade of fertilizer an acre in 1944, but the crop failed to get started because of drouth.

A 2-ton application of limestone and another 600-pound application of 5-10-10 were made in 1945, and a good stand of Ranger alfalfa was established.

Except for plot 5, no topdressings were applied until 1947.

The most important variables in the topdressing tests were the dates of application of fertilizer and the rate of application of the potassium.

The dates of application compared were early spring, after the first cutting, and after the second cutting.

The potassium topdressings varied between 0 and 180 pounds $K_2O$ an acre annually, in 60-pound increments.

A number of other soil amendments, including some of the minor elements, were used as topdressings.

Three cuttings were harvested every year for 4 years.

Studies were also made of alfalfa in culture solutions and in pots of soil.

The highest field yields were obtained by topdressing with 180 pounds $K_2O$ an acre annually, together with 60 pounds $P_2O_5$ and 20 pounds borax.

Applications in early spring were more effective than those made after the first crop had been removed.

Nitrogen applications tended to encourage weeds, whereas potassium applications discouraged them.

Topdressings of magnesium sulfate, limestone, and sodium molybdate, although not markedly effective, tended to increase yields.

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# Trends in Soil Management in Peach Orchards

*By Harry K. Bell*

Department of Horticulture, Rutgers University, New Brunswick, New Jersey

ABOUT two decades ago, it became apparent that there was a need for a re-evaluation of soil-management practices in peach orchards in many parts of the United States. Some sort of soil cultural system which reduced cultivation to a level below that formerly practiced was evidently needed. A need for a change from a nitrogen-only fertilization program for peach trees was evidenced by the increasing occurrence of various nutritional troubles.

Peach orchard soil-management problems received but little attention prior to World War I. Severe cultivation was considered a necessity, and in dry years the better orchardists sometimes cultivated their peach orchards 20 to 25 times. The value of cover crops for controlling erosion and "catching" snow, rain, and nutrients was recognized by a few orchardists. Most were slow in adopting their use, however, and severe cultivation was the rule during this period. Fertilizers, when applied, were usually a by-product material, such as bone meal, wood ashes, or barnyard manure.

Early sentiment in favor of intense cultivation for peaches appears to have been largely upon grower-observation. Most of the research on soil cultural problems in orchards during the first quarter of the present century dealt with fruits other than the peach. It wasn't until attention was focused on the ultimate detrimental effects of ero-

**Fig. 1. Severe dieback, induced by overliming, on a New Jersey peach tree. The pH of the soil here was near 7.0., too high for peaches on light soils such as this.**

sion to all types of agriculture during the early 1930's that serious attention was given to research on various soil cultural systems for peaches.

Nearly all recent soil cultural experiments, as well as the observations of growers, lend support to the belief that some cultivation is needed yearly in peach orchards. When cultivation is carried on too intensely, however, such a system is not only detrimental to the soil structure and its fertility, but often results in lower yields of fruit. The value of cover crops, sods, and mulches in improving soil tilth, retarding erosion, and conserving moisture and nutrients in peach orchards has been demonstrated several times in recent years. As a consequence, there is a definite trend toward less cultivation in peach orchards. In many places it has reached what is considered to be a bare minimum of two or three spring and early summer diskings.

### Contour Planting

Much soil erosion on sloping land can be stopped by planting orchards on the contour. Terraces are suitable on land having no more than a 12 per cent slope. Their presence practically eliminates soil erosion. Several states now recommend that most peach orchards be contour-planted.

While the possibility of permanent sods in commercial peach orchards has been considered from time to time, there doesn't appear to be any outright recommendation for their use in any state. In experimental plots, sod-grown peach trees have almost always made poorer growth and produced lower yields than similar trees under cultivation. It is generally believed that lack of soil moisture and soil nitrates are the two main limiting factors for sod-grown peach trees.

Newly-set peach trees appear to require rather intensive cultivation during their first two or three years. More rapid early growth, with correspondingly earlier commercial production, is the result. If cover crops, such as soybeans, or intercrops, such as tomatoes or strawberries, are grown in a young peach orchard, they should be kept five or six feet from the tree rows. Extra fertilizer should be added to take care of the needs of these crops.

Summer cover crops are now grown in many peach orchards. In New Jersey, crops such as soybeans or cowpeas are sown during the first two weeks in June and disked into the ground in late summer in preparation for a winter cover crop. Sudan grass, buckwheat, and other crops are also used in some areas.

### Winter Cover Crops

Winter cover crops are usually needed in practically all peach orchards. Rye, wheat, and ryegrass have been found suitable for most New Jersey conditions. Hairy vetch is sometimes sown in a mixture with one of these crops.

In young orchards in New Jersey, the summer cover crop should be sown by the first week in July. In bearing orchards, the size of the peach crop usually determines the time of sowing the winter cover. If there is but a light fruit crop, or none at all, it should be sown by the middle of August. The growing cover then competes with the trees, thus slowing down their growth and permitting the new wood to harden-up for the winter. If there has been a heavy crop of peaches, the cover crop should not be sown until the middle of September. This permits the trees to replace food reserves used up in producing the fruit crop.

Any cover crop, regardless of its type or its purpose, usually needs fertilization if it is to perform its function well. On sandy soils, such as are found in South Jersey, 200 to 300 pounds per acre of 7-7-7, or its equivalent, usually result in good cover crop response. If straight legumes are used, about 200 pounds per acre of 0-10-10 give good response.

The use of sods with mulches in peach orchards is a system of soil culture which is receiving increased attention in various states. Experiments

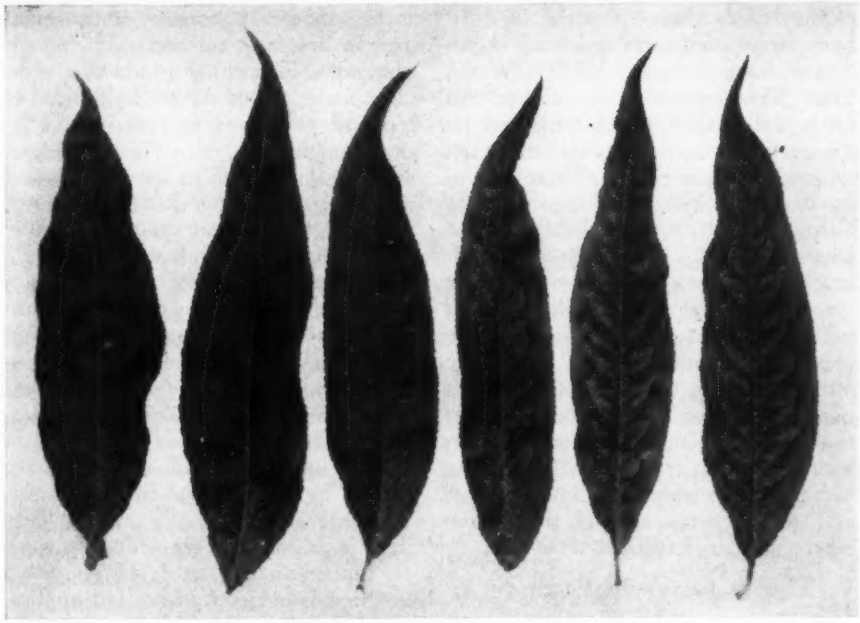

**Fig. 2. Leaves from manganese-deficient peach trees in New Jersey. The leaf on the extreme left is from a healthy tree. Severity of the symptoms on the other leaves increases from left to right.**

with this system have been conducted in New Jersey, Ohio, Indiana, Missouri, Kentucky, and Maryland. When mulches are used, two main points should be kept in mind: (1) the depth of the mulching material should be maintained at six to eight inches, or deeper; (2) two or three times more nitrogen fertilizer will have to be applied, at least during the first two or three years, than is applied under a clean cultivation system. Furthermore, pests, such as mice, curculio, oriental fruit moth, tarnish plant bug, and buffalo tree hopper, are often more prevalent in a mulched orchard.

The cost of mulching materials appears to be the main factor limiting their use in peach orchards. They afford several advantages, in addition to conserving moisture, which are often overlooked by orchardists. Thus, (1) soil structure is maintained or improved; (2) soil erosion is greatly reduced; (3) soil organic matter is maintained or increased; (4) the mulch, itself, is a source of plant nutrients; (5) plant nutrients, such as potassium, are released from the soil complex at a more uniform rate under mulches; (6) the cost and time involved in cultivation are eliminated; (7) the costs of cover crop seed and the sowing of the seed are eliminated; (8) a good footing is provided on the orchard floor for the travel of heavy equipment.

Fertilizers used by early peach growers really deserved the term "complete" more so than those used by orchardists in later years. Before the turn of the century, materials such as lime, manure, bone meal, and wood ashes, were used by orchardists. Nutrient deficiencies were not very common in peach soils. Nutritional diseases, such as little-leaf, due to zinc deficiency; leaf-scorch, caused by a lack of potash; and leaf-mottle, a result of manganese deficiency, were all uncommon. Troubles such as these have become more apparent in recent years and seem to be due, in part at least, to unbalanced nutrition resulting from the use of only nitrogenous fertilizers.

The trend toward the use of only nitrogenous fertilizers for peaches began at about the time of the first World War. Experimental evidence in several states had usually shown a marked response to nitrogen by peach trees. A response to other materials was usually not as evident nor as striking as that to nitrogen. This was probably due to several reasons. Data were often collected for only a year or two and the long-range effect of the fertilizers was not considered. The amount of tree growth and total yield of fruit were often the only criteria noted. Fruit quality was not as important then as now, and this factor was usually overlooked. Nitrogen generally gave larger yields, but the fruits were often smaller and more poorly colored than those where mineral fertilizers were used.

### Use of Complete Fertilizer

Most authorities agree that nitrogen is the element most often needed in the peach-orchard fertilization program. Some states still recommend only nitrogenous fertilizers for peaches. There is a definite trend, however, toward the use of complete fertilizers for peach trees. Chemical analyses have clearly shown that peach trees and fruits use fairly large amounts of several common minerals found in the soil. For example, a 20-year-old peach orchard will remove from the soil during its lifetime approximately the following amounts of materials per acre: 200 pounds of $P_2O_5$; 1,300 pounds of $K_2O$; 80 pounds of CaO; 90 pounds of MgO; and 900 pounds of N. These figures, of course, will vary somewhat, depending on soil fertility, fertilizer practice, the variety of peach grown. Certain minor elements, such as boron, zinc, manganese, copper, and iron, are also used by peaches. When only nitrogen is used in the fertilizer program, it seems logical to assume that peach orchards in such locations will sooner or later become deficient in one or more of these other materials.

Usually, non-bearing peach trees that make about 18 inches of terminal growth annually are receiving enough nitrogen. Trees that produce a good crop make about 12 to 15 inches of terminal growth when they are receiving enough nitrogen. The practice of applying one-fourth to one-third pound of nitrogen fertilizer per year of tree age is a fairly good guide to follow. This should be considered merely as a guide, and individual tree attention should be given. This is especially important when applying nitrogen, and some growers go through their plantings after the over-all fertilization and give their weak trees an extra application of fertilizer.

Split applications of nitrogen have proven to be beneficial in some areas. This has been especially true on very light soils, such as are found in some of the southern states where severe leaching is a factor. Late fall applications of nitrogen have been successful in some states. Even on sandy soils, the loss of nitrogen due to over-winter leaching appears to be rather small. The roots of peach trees will absorb nitrates as long as the soil temperature remains a few degrees above freezing. The main advantage of fall applications, especially in the southern states, is the early vigorous start made by the trees in the spring. This appears to be due to the presence of relatively large amounts of nitrates in the twigs as a result of absorption of the material during the winter.

### Potash Deficiency

Potassium is the mineral element most likely to be found deficient in peach soils. The peach appears to be a heavy feeder on this material. Many cases of potassium deficiency in peach orchards have been reported in recent years. Usually, these orchards have been found on light soils in New Jersey, Delaware, Virginia, Maryland, Indiana, South Carolina, Georgia, and Michigan. It is true, however, that a majority of our peach orchards are on light soils similar to these. Therefore,

when considering fertilizer programs for peach orchards, especially on very light soils, the potash application should equal that of nitrogen.

Phosphorus, for some reason or other, has not usually produced noticeable response in peach trees. This holds true for practically all tree fruits. Peaches contain relatively small amounts of this material, but so do many of the annual crops which give marked response to phosphates. California data have shown that certain annual field crops markedly increased in both growth and yield under phosphate fertilization. Yet no response was noted from applications of the same material to adjacent nursery fruit trees, which included the peach. It may be the fruit trees are able to "forage" for this element better than are annual crops. Response by peaches to applications of phosphate has been obtained in two or three states, but these cases, in experimental work, have been the exception rather than the rule. It probably is a good idea to apply some phosphate to the peach orchard, especially where good cover crop growth is needed. The use of large annual amounts of the material, especially on sandy soils, does not appear to be justified. High phosphorus in peach trees, as well as in other plants, retards the intake of nitrates, and in some situations it has appeared to reduce growth and yield. There is evidence, too, which indicates that over-fertilization with phosphate on sandy soils may induce a zinc deficiency in peach trees.

Cases of magnesium deficiency in peach trees appear to be few in number. The requirements of the peach for this element seem to be low, when compared with the apple. It is probable that the use of dolomitic limestone in the peach orchard fertilization program should take care of the trees' needs for this element.

Calcium deficiency appears to be a rare occurrence in peach orchards. As long as lime is used to maintain the soil at a pH of about 5.5, there should be no trouble from a deficiency of this element.

The problem of soil acidity for peach trees, as well as for most other tree fruits, has never been solved. Peaches have been grown and have produced

(*Turn to page* 39)

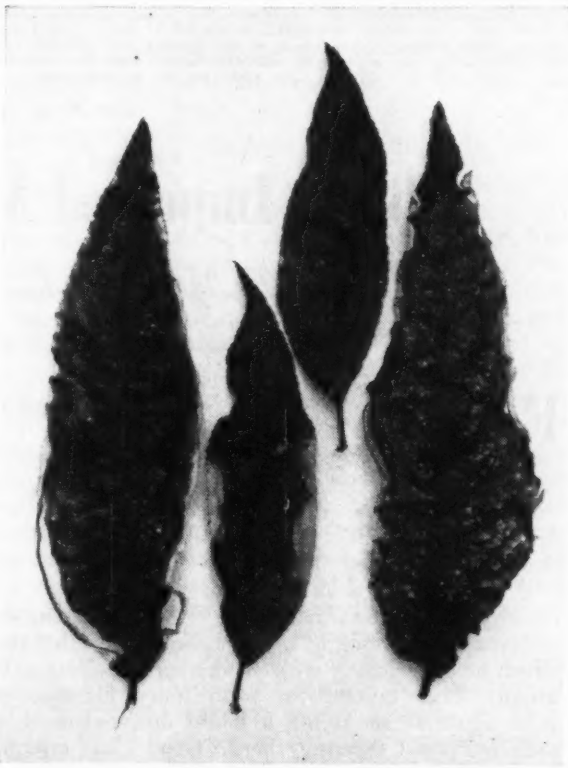

**Fig. 3. Potassium-deficiency symptoms on peach leaves. Note the marginal scorching on the three lower leaves and the necrotic blotches on all leaves. Upper leaf has symptoms in the beginning stage. Crinkling of leaves is often present in advanced stages as in the two end leaves.**

**Fig. 1. The ladino clover plant at the bottom was treated two months previously with borax. The plant at the top is from an untreated area. Note the longer internodes, fuller tops, and better roots on the treated plants.**

# Boron Improved Meadow

*By W. D. Bashore*

Farm Editor, Journal Gazette, Fort Wayne, Indiana

FOR three long years, Dick Reynolds, Noble County, Indiana, farmer, worked against seemingly hopeless odds to get some meadow established on his farm. Despite everything he did—liming, heavy fertilization, good seedbed preparation—his 1947 seeding of alfalfa, ladino, and timothy was a dismal failure.

Reynolds operates a 141-acre farm which he owns jointly with his brother, Hugh. They bought the farm four years ago and are trying to build up their registered Guernsey herd. Good hay and pasture are essential, of course.

"Our hay was a bunch of sticks," he said. "Short, dry alfalfa doesn't make good feed. And we had to get down on our knees to hunt for the ladino. Even though we have plenty of acreage, we've had to buy hay every year since we bought the farm."

Last October the picture changed. Reynolds' worried frown was replaced with a hopeful, almost unbelieving smile. "I can expect some good hay from my own farm next year," he said.

What changed his outlook?

Borax. Only 20 pounds to the acre. He discovered that his land was deficient in boron, a minor, but nevertheless essential element.

It was Milfred Richman, Noble County Soil Conservation Service farm planner, who helped him solve his

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# Bermuda Grass Can Be Used In Corn Rotations[1]

*By Glenn W. Burton and E. H. DeVane*[2]

SOD crops have been an important part of crop rotations in the northeastern United States for many years. Increased yields of both cultivated and sod crops and conservation of soil resources have been some of the benefits derived from such rotations.

In the southeastern United States, where there would seem to be an even greater need for such rotations, very little use has been made of them. Limited acreages of cultivated land, lack of livestock and facilities to convert sod crops into cash, and the lack of suitable sod crops and equipment to handle them in a rotation are probably the main reasons that they have not been used. Increased size of farm units, acres made idle because of crop control, and increased demands for livestock feed are changing this picture. Modern tractor equipment now available on most farms will handle sod crops that the plow hand with one mule could never cope with.

### Resistance to Bermuda

Many people are of the opinion, however, that only certain kinds of sod crops can be used in rotations successively. The years of fighting Bermuda grass in cultivated fields with a mule and a plow stock have convinced them that Bermuda grass has no place in rotation with cultivated crops. Some farmers, probably because all of their cultivated land was infested with Bermuda grass, have in reality grown cultivated crops in rotation with it. Usually they have allowed the Bermuda sod to grow thin and have tried to destroy most of it before planting the land to the cultivated crop. A number of them have observed that crop yields were better in those parts of the field where Bermuda grass had grown. In most instances, however, the cost of destroying the Bermuda sod probably exceeded the value of the increased yields.

### Georgia Began Study in 1949

A study of some of the problems associated with the growing of corn in rotation with a heavy Bermuda sod was begun at the Georgia Coastal Plain Experiment Station in 1949. In order to study the effects of Bermuda grass strains and the residual effect of fertilizer applied to them, an acre of Tifton sandy loam that had been in the following experiment was chosen: Five fertilizer treatments had been applied for seven years across duplicate tenth-acre plots of five strains of Bermuda grass grown alone and with crimson clover. Crimson clover growth had been very good one year and fair to poor during the other years of the test. During the seven-year period totals of 0, 436, and 872 pounds of nitrogen had been applied to the three fertilizer treatments considered here. All above-ground growth had been removed as hay. The check strip mentioned later in this paper cut the field in half, lengthwise. The weeds and the small amount of Bermuda grass that had

[1] Cooperative investigations at Tifton, Georgia, of the Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture, the Georgia Coastal Plain Experiment Station, and the Georgia Experiment Station.

[2] Senior Geneticist and Agent, U. S. Department of Agriculture, Tifton, Georgia. The assistance of Dr. P. M. Gilmer and D. W. LaHue in making the lesser cornstalk borer counts is gratefully acknowledged.

TABLE I.—VARIATIONS IN THE SOD OF DIFFERENT BERMUDA GRASS SELECTIONS AND THEIR EFFECT UPON THE CORN GROWN UPON THEM IN 1949.

| Strain number | Density of roots and rhizomes | Ease of turning and preparing soil | Number of plants per acre | | Bushels of shelled corn per acre |
|---|---|---|---|---|---|
| | | | Free of lesser cornstalk borer damage on May 25 | Bearing ears at harvest | |
| 1 | Heavy | Difficult | 2,270 | 8,660 | 44.9 |
| 3 | Very heavy | Difficult | 5,050 | 10,800 | 49.4 |
| 13 | Light | Easy | 5,770 | 12,300 | 62.6 |
| Coastal | Medium | Easy | 6,180 | 11,300 | 52.6 |
| 99 | Medium | Easy | 3,510 | 10,900 | 50.9 |
| Check strip | None | Very easy | 9,110 | 9,800 | 51.0 |

grown in this strip during the course of the test were removed in the fall of 1948.

On April 15, 1949, the undisturbed Bermuda sod with a light growth of crimson clover on the crimson clover plots was turned about seven inches deep with a tractor-drawn turning plow. Sixty pounds of nitrogen per acre were applied and thoroughly disked in on April 20. Dixie 18 corn (always planted in furrows in this section) was planted with a surface planter in three-foot rows on April 25. Five hundred pounds of 4-8-8 per acre were applied at planting time. Only disks were used to cultivate the corn. When it was about five inches high they were set to throw the soil away from the plants. Half of each plot received an additional 80 pounds of nitrogen per acre as a sidedressing on June 2. The corn was then laid by with the cultivator disks set to throw the soil back to the corn.

## Results

The data in Table I show that the five Bermuda strains were very different in density of roots and rhizomes and also in the ease with which they could be turned. Plowing sod of strains like Coastal required more power than the check strip but a rea-

TABLE II.—THE EFFECT OF CRIMSON CLOVER, PAST, AND CURRENT FERTILIZATION UPON THE YIELDS OF CORN GROWN ON BERMUDA GRASS SOD IN 1949.

| Past fertilization treatments | Bushels of corn per acre following: | | | |
|---|---|---|---|---|
| | Crimson clover+Sod | | Grass sod—No clover | |
| | 2N** | N** | 2N** | N** |
| No treatment | 52.5 | 41.6 | 51.6 | 33.1 |
| PK+Low N* | 64.1 | 54.0 | 52.4 | 33.0 |
| PK+High N* | 68.5 | 66.3 | 61.4 | 34.4 |

5% L S D = 8.1 bushels.
Check strip yields for 2N = 59.7 bushels per acre; for N = 42.3 bushels per acre.
* Totals of 436 and 872 pounds of N per acre were applied to the low N and high N plots respectively during the past seven years. All top growth had been removed as hay.
** Totals of 80 and 160 pounds of N per acre were currently applied to the N and 2N plots respectively in 1949.

sonably smooth job of turning resulted. Considerably more power was required to turn strains one and three and the land on which they grew was much rougher after turning.

It became apparent in early May that the lesser cornstalk borer was damaging corn on the Bermuda grass plots more than on the check strip. Counts of uninfested plants made by Station Entomologists on May 25 revealed that the number of uninfested plants was influenced by the strain of Bermuda grass that grew on the land. See Table I. Generally the lesser cornstalk borer female deposits her eggs at the base of the young corn plant. Since the young corn plants appeared to be making equally good growth on all plots before the borers attacked, it is difficult to explain the variations in infestation that were recorded. It seems quite probable, however, that the eggs must have been laid on the Bermuda grass plants before the sod was turned and that the infestation counts actually show variations in the attractiveness of these Bermudas to the female borers. In most years the Bermuda grass sod would be turned before the lesser cornstalk borers would be laying eggs. In those years when plowing would have to be delayed, however, the Bermuda strain used in the rotation might make quite a difference in the lesser cornstalk borer damage to the corn.

That many of the borer-infested plants were able to recover is shown in the counts of the number of stalks per acre bearing ears shown in Table I. Many of these stalks were actually suckers and probably did not do as well as the original stalk would have done. Nevertheless the yields of corn on most of the plots compared favorably with the yields from the check strip where the Bermuda grass had been removed and where the borer damage had been insignificant.

The effects of some of the past and current fertilization treatments upon the yields of corn growing on these Bermuda plots are shown in Table II. The 500-pound application of 4-8-8 fertilizer per acre at planting time would seem to exclude phosphorus or potash as elements responsible for the yield differences shown in this table. It is believed, therefore, that variations in available nitrogen are largely responsible for the differences in yield obtained. The very poor growth made by the crimson clover planted on the no-treatment plots explains the lower corn yields obtained on those plots. Table II indicates that high nitrogen fertilization of a Bermuda grass hay, meadow, or pasture may be expected to result in increased yields of the corn grown in rotation with it.

## Conclusions

The observations reported here, although very preliminary in nature, seem to warrant the following conclusions: Corn can be easily and successfully grown on a heavy Bermuda grass sod following the methods used in this study. Deep turning, surface planting, adequate fertilization, and cultivation with tractor equipment appear to be essential features of the practice. The desirability of having a legume like crimson clover or blue lupine growing on the Bermuda sod before and at the time that it is turned is evident.

There is good reason to believe that Coastal Bermuda will be better suited to corn rotations than common Bermuda. Coastal Bermuda is an excellent hay plant and might fit into a strip-cropping system with corn on the steeper slopes in the South. Such a system should permit the production of corn and hay, two basic livestock feeds, on land now considered too steep for the growing of clean-cultivated crops. Past experience would indicate that enough Bermuda grass would generally survive the cultivations to replant the strips in which corn was grown. This characteristic of Bermuda grass would seem to make it superior to many other grasses that must be seeded in the cultivated strips in order to maintain them in the strip-cropping system.

**Fig. 1. Roscoe Fraser, right, Purdue Tomato Specialist, presenting watches to Reserve U. S. "Won" Champion Glen McCain, left, and U. S. "Won" State Tomato Champion Charles Austin.**

# 1949 Tomato Champions

*By Roscoe Fraser*

Vegetable Specialist, Agricultural Extension Service, Purdue University, Lafayette, Ind.

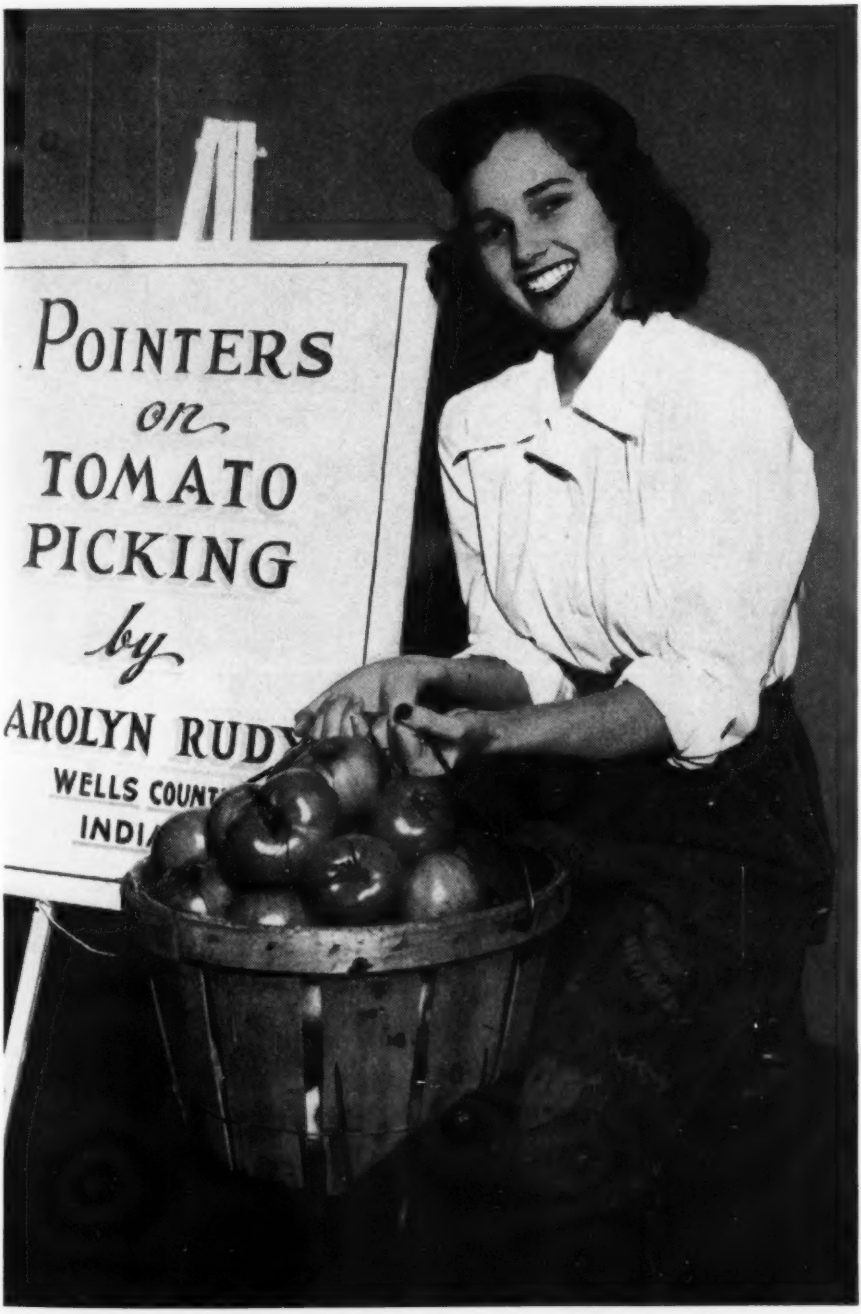
CHARLES AUSTIN, 18-year-old Clinton county Indiana farm youth, was named 1949 State champion in the U. S. "Won" Tomato Club contest by Roscoe Fraser, Purdue University Extension Horticulturist and State Tomato Project Leader. Austin produced 16.495 tons of tomatoes per acre on a plot of 5.87 acres. The yield, grown for Kemp Brothers Packing Company, Inc., Frankfort, graded 80.56 per cent U. S. No. 1.

The son of Mr. and Mrs. William Austin, R. 1, Frankfort, young Austin is a former 4-H Club member and holds the Hoosier Farmer degree in the Future Farmers of America. He was graduated from Rossville High School last spring as the top man scholastically in his class. This year's tomato crop was his second, the first having been grown two years ago in a 4-H Club project. That crop produced about nine tons per acre.

The winning crop was grown on the Austin's 100-acre farm situated 10 miles north of Frankfort near the Carroll county line. The field used was a clover and timothy pasture in 1948. Before plowing last spring, the ground was covered thoroughly with about 10 loads of manure per acre. About 350 pounds of 0-12-12 fertilizer per acre were plowed under, and 250 pounds of 4-12-8 fertilizer per acre were used in the rows at planting time.

Austin grew the Rutgers variety and used direct seeding instead of setting plants. Seeding was done April 20. When the plants were far enough along, he blocked them out with a hoe,

(*Turn to page* 35)



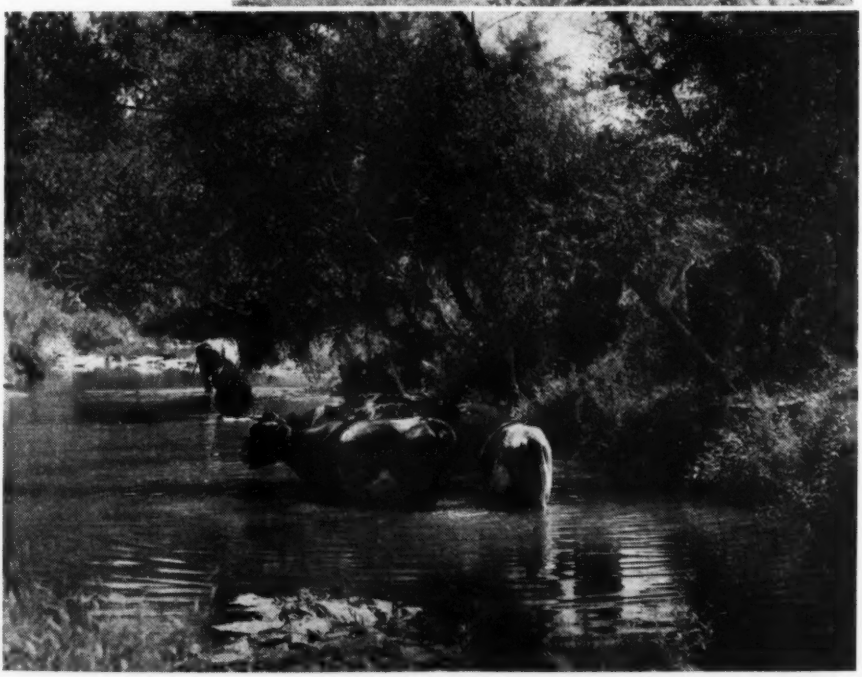

Carolyn Rudy, among other pointers, is demonstrating fingernail polish the color of a minimum U. S. No. 1 tomato. This polish was developed several years ago by Mr. Fraser to aid pickers in getting the highest percentage of No. 1 tomatoes. Miss Rudy, incidentally, is a U. S. No. 1, having been awarded the 1949 Junior Miss America title at Pittsburgh, Pa. At the National Junior Vegetable Demonstration Contest in the Marketing Division, Washington, D. C., last December she placed fourth.

*Above:* **Idle drifting!**

*Left:* **Making time!**

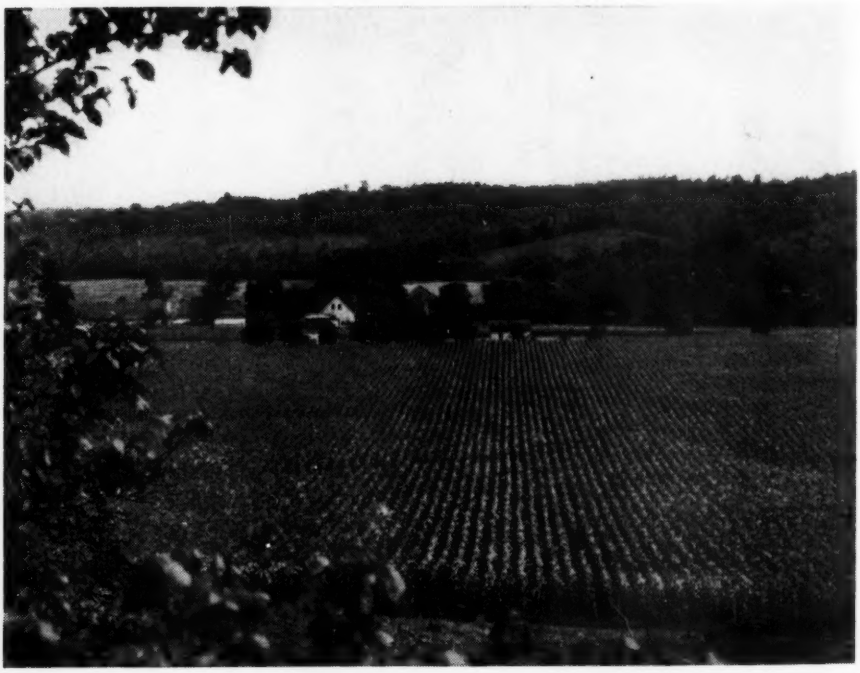
*Right:* **Shoving off!**

*Below:* **Cooling Milk?**



***Above:*** **Farm families enjoying a Sunday picnic.**

***Below:*** **Indiana corn framed in a pretty setting.**



# The Editors Talk

## Supply and Demand

Some interesting figures on the supply and demand of farm products were given by Byron T. Shaw, Deputy Administrator, Agricultural Research Administration, during a recent meeting of the National Association of Radio Farm Directors. In referring to the great changes in agriculture which have taken place within our lifetime, Mr. Shaw pointed out that in the last 20 years the per-acre yield of corn has been increased 36 per cent. Cotton is up 58 per cent; potatoes, 68; soybeans, 59; and oats, 17 per cent. Along with increased yields, we have learned how to grow better crops and better livestock—tailor-made for specific uses. We have developed new methods of processing which give us new uses for some agricultural commodities and many entirely new types of products.

"Although not so striking as changes in production, we have seen some marked changes in consumption," Mr. Shaw said. "We're shifting from high caloric foods and eating more of the protective foods such as meat, fruits, vegetables, eggs, and milk. For instance, in 1949 we ate 17 per cent more dairy products other than butter and 26 per cent more eggs than we ate during the period 1935-39. We ate 19 per cent less of potatoes and 12 per cent less of grain products. Over-all, we ate about 5 per cent more food."

In further explanation, he stated that up until 1935 all our improvements in crop production practices were only able to hold national yields per acre at somewhere near existing levels. This was not due to a lack of scientific progress but because soil deterioration was proceeding at a rate sufficient to offset all the improvements. We have been making gains since 1935. We're beginning to slow down soil deterioration and in some cases stop it and start on the up-grade.

Mr. Shaw believes that if we ever get around to setting a ceiling on crop production, it will probably be set by the amount of water available for crop growth. As we get better varieties of crops, improved methods of fertilization, better insecticides, and other improved practices, water will become even more important. We still have a lot to learn on the problems of conserving soils and water, but we are stabilizing and improving our soil and water base.

There is much more that might be said about this soil and water base, and Mr. Shaw's emphasis is well placed. The spread of irrigation with subsequently more efficient use of plant food is well known. The excellent work of the Soil Conservation Service, particularly in its land capability and use studies, is effectively directing production into channels of best procedure. The Extension Service is interpreting for those with specific problems the results of research and experiment. Tillage practices and rotations to conserve soil moisture, together with well-proved fertilizer recommendations to build up and maintain soil fertility, are being put into more general use. With them will come crops and livestock products of better quality and nutritional value, to stimulate the demands for our increasing supplies.

## Fertilizer Technology

On August 21-25 at the University of Maryland, College Park, Maryland, the Fertilizer Committee of the Soil Science Society of America sponsored a Short Course in Fertilizer Technology. This was the outgrowth of many discussions among soil scientists, agronomists, and fertilizer technologists in the Industry, State, and Federal services concerning the need for exchange of information on advances in the technology and processing of fertilizers and fertilizer materials.

States were invited to send one or more members of the college staffs who were interested in the subject. In order to present the material, technical men from producing organizations were asked to present papers covering various phases of the over-all subject. In this way excellent material was collected from many sources and presented in concentrated form.

Each speaker prepared his talk in mimeographed form so that all participants could take away with them the complete subject matter. This was supplemented with interesting and valuable discussions at the end of each paper. The lack of any one source for material of this nature made the course all the more valuable, and it is planned that all the papers will be printed together as a monograph of the American Society of Agronomy. Some of the information probably had never been presented in printed form. The papers were rounded out with trips to plants and motion pictures so that those attending the meetings took away with them knowledge gained by ear and eye.

This was the first course of this type ever held. The University of Maryland acted as host, with Dr. Werner L. Nelson of the North Carolina Department of Agronomy acting as chairman and Dr. K. D. Jacob of the U. S. Department of Agriculture taking care of the details of organizing the program and collecting the papers. A great number of states were represented by one or more delegates.

It was felt that all benefited by a better knowledge of the problems involved in the manufacture of fertilizers. This in turn would be a help in arriving at recommendations, in teaching fertilizer usage, and in formulating policies with reference to the various aspects of the fertilizer field. In the final analysis, the benefit will accrue to the American farmer who is now using each year more than 18 million tons of fertilizer.

## You Work Too Hard?

"We work mighty hard for what we get," said a woman delivering eggs from house to house.

So do a lot of other people in this old world, and not alone farmers. Consider the chap who runs a grocery store, or a drugstore, or a restaurant—long hours if the business is to pay out, and on edge much of the time, dealing with a percentage of unreasonableness in customers. What a drain on patience it sometimes is for the butcher to sell a woman a cut of meat for her Sunday dinner! And maybe the hardest job of all is the church janitor—buffeted from all sides by a multiplicity of those who think they should be his boss. More chairs here, fewer chairs there, put the tables up, take them down, the church is too hot, or too cold, open windows, shut 'em, pick up after a children's party, and did you find Johnny's rubbers, and if not, why not?

Yet, you know, some way, those who work hardest and longest, whether waiting on a bunch of hens (feathered hens), or milking a bunch of cows 730 times a year, or waiting on trade in a store, or driving miles out into the country in a blizzard to tend a sick child, some way those are the people who keep well, live long, and get the most satisfaction out of life.

If you are looking around for somebody to feel sorry for, don't overlook the poor cuss with nothing to do.—*The Corn Belt Farm Dailies.*

## Season Average Prices Received by Farmers for Specified Commodities *

| Crop Year | Cotton Cents per lb. Aug.-July | Tobacco Cents per lb. ..... | Potatoes Cents per bu. July-June | Sweet Potatoes Cents per bu. July-June | Corn Cents per bu. Oct.-Sept. | Wheat Cents per bu. July-June | Hay[1] Dollars per ton July-June | Cottonseed Dollars per ton July-June | Truck Crops .... |
|---|---|---|---|---|---|---|---|---|---|
| Av. Aug. 1909–July 1914.... | 12.4 | 10.0 | 69.7 | 87.8 | 64.2 | 88.4 | 11.87 | 22.55 | .... |
| 1925..... | 19.6 | 16.8 | 170.5 | 165.1 | 69.9 | 143.7 | 12.77 | 31.59 | .... |
| 1926..... | 12.5 | 17.9 | 131.4 | 117.4 | 74.5 | 121.7 | 13.24 | 22.04 | .... |
| 1927..... | 20.2 | 20.7 | 101.9 | 109.0 | 85.0 | 119.0 | 10.29 | 34.83 | .... |
| 1928..... | 18.0 | 20.0 | 53.2 | 118.0 | 84.0 | 99.8 | 11.22 | 34.17 | .... |
| 1929..... | 16.8 | 18.3 | 131.6 | 117.1 | 79.9 | 103.6 | 10.90 | 30.92 | .... |
| 1930..... | 9.5 | 12.8 | 91.2 | 108.1 | 59.8 | 67.1 | 11.06 | 22.04 | .... |
| 1931..... | 5.7 | 8.2 | 46.0 | 72.6 | 32.0 | 39.0 | 8.69 | 8.97 | .... |
| 1932..... | 6.5 | 10.5 | 38.0 | 54.2 | 31.9 | 38.2 | 6.20 | 10.33 | .... |
| 1933..... | 10.2 | 13.0 | 82.4 | 69.4 | 52.2 | 74.4 | 8.09 | 12.88 | .... |
| 1934..... | 12.4 | 21.3 | 44.6 | 79.8 | 81.5 | 84.8 | 13.20 | 33.00 | .... |
| 1935..... | 11.1 | 18.4 | 59.3 | 70.3 | 65.5 | 83.2 | 7.52 | 30.54 | .... |
| 1936..... | 12.4 | 23.6 | 114.2 | 92.9 | 104.4 | 102.5 | 11.20 | 33.36 | .... |
| 1937..... | 8.4 | 20.4 | 52.9 | 78.0 | 51.8 | 96.2 | 8.74 | 19.51 | .... |
| 1938..... | 8.6 | 19.6 | 55.7 | 69.8 | 48.6 | 56.2 | 6.78 | 21.79 | .... |
| 1939..... | 9.1 | 15.4 | 69.7 | 73.4 | 56.8 | 69.1 | 7.94 | 21.17 | .... |
| 1940..... | 9.9 | 16.0 | 54.1 | 85.4 | 61.8 | 68.2 | 7.59 | 21.73 | .... |
| 1941..... | 17.0 | 26.4 | 80.8 | 92.2 | 75.1 | 94.4 | 9.70 | 47.65 | .... |
| 1942..... | 19.0 | 36.9 | 117.0 | 118.0 | 91.7 | 110.0 | 10.80 | 45.61 | .... |
| 1943..... | 19.9 | 40.5 | 131.0 | 206.0 | 112.0 | 136.0 | 14.80 | 52.10 | .... |
| 1944..... | 20.7 | 42.0 | 150.0 | 190.0 | 109.0 | 141.0 | 16.50 | 52.70 | .... |
| 1945..... | 22.5 | 36.6 | 143.0 | 204.0 | 127.0 | 150.0 | 15.10 | 51.10 | .... |
| 1946..... | 32.6 | 38.2 | 124.0 | 218.0 | 156.0 | 191.0 | 16.70 | 72.00 | .... |
| 1947..... | 31.9 | 38.0 | 162.0 | 217.0 | 216.0 | 229.0 | 17.60 | 85.90 | .... |
| 1948..... | 31.0 | 38.7 | 153.0 | 219.0 | 136.0 | 205.0 | 19.00 | 67.80 | .... |
| 1949 | | | | | | | | | |
| August..... | 29.32 | 44.6 | 154.0 | 267.0 | 118.0 | 179.0 | 16.05 | 44.40 | .... |
| September... | 29.70 | 48.7 | 138.0 | 230.0 | 116.0 | 187.0 | 16.25 | 43.50 | .... |
| October..... | 28.70 | 47.4 | 130.0 | 196.0 | 109.0 | 189.0 | 16.75 | 41.80 | .... |
| November... | 27.76 | 43.4 | 134.0 | 189.0 | 102.0 | 190.0 | 16.75 | 42.30 | .... |
| December.... | 26.50 | 45.4 | 131.0 | 202.0 | 113.0 | 193.0 | 17.15 | 43.30 | .... |
| 1950 | | | | | | | | | |
| January..... | 26.47 | 39.7 | 136.0 | 215.0 | 115.0 | 192.0 | 17.15 | 43.60 | .... |
| February.... | 27.50 | 34.1 | 133.0 | 221.0 | 116.0 | 193.0 | 16.75 | 43.60 | .... |
| March..... | 28.05 | 32.0 | 132.0 | 222.0 | 119.0 | 198.0 | 16.45 | 43 00 | .... |
| April..... | 28.74 | .... | 134.0 | 228.0 | 126.0 | 201.0 | 16.65 | 44.40 | .... |
| May..... | 29.24 | 48.5 | 128.0 | 228.0 | 134.0 | 204.0 | 17.25 | 45.20 | .... |
| June..... | 29.91 | 49 7 | 127.0 | 211.0 | 136.0 | 193.0 | 16.05 | 46.20 | .... |
| July..... | 33.05 | 45.5 | 127.0 | 208.0 | 144.0 | 199.0 | 15.15 | 52.00 | .... |
| **Index Numbers (Aug. 1909—July 1914 = 100)** | | | | | | | | | |
| 1925..... | 158 | 168 | 245 | 188 | 109 | 163 | 108 | 140 | 143 |
| 1926..... | 101 | 179 | 189 | 134 | 116 | 138 | 112 | 98 | 139 |
| 1927..... | 163 | 207 | 146 | 124 | 132 | 135 | 87 | 154 | 127 |
| 1928..... | 145 | 200 | 76 | 134 | 131 | 113 | 95 | 152 | 154 |
| 1929..... | 135 | 183 | 189 | 133 | 124 | 117 | 92 | 137 | 137 |
| 1930..... | 77 | 128 | 131 | 123 | 93 | 76 | 93 | 98 | 129 |
| 1931..... | 46 | 82 | 66 | 83 | 50 | 44 | 73 | 40 | 115 |
| 1932..... | 52 | 105 | 55 | 62 | 50 | 43 | 52 | 46 | 102 |
| 1933..... | 82 | 130 | 118 | 79 | 81 | 84 | 68 | 57 | 91 |
| 1934..... | 100 | 213 | 64 | 91 | 127 | 96 | 111 | 146 | 95 |
| 1935..... | 90 | 184 | 85 | 80 | 102 | 94 | 63 | 135 | 119 |
| 1936..... | 100 | 236 | 164 | 106 | 163 | 116 | 94 | 148 | 104 |
| 1937..... | 68 | 204 | 76 | 89 | 81 | 109 | 74 | 87 | 110 |
| 1938..... | 69 | 196 | 80 | 79 | 76 | 64 | 57 | 97 | 88 |
| 1939..... | 73 | 154 | 100 | 84 | 88 | 78 | 67 | 94 | 91 |
| 1940..... | 80 | 160 | 78 | 97 | 96 | 77 | 64 | 96 | 111 |
| 1941..... | 137 | 264 | 116 | 105 | 117 | 107 | 82 | 211 | 129 |
| 1942..... | 153 | 369 | 168 | 134 | 143 | 124 | 91 | 202 | 163 |
| 1943..... | 160 | 405 | 188 | 235 | 174 | 154 | 125 | 231 | 245 |
| 1944..... | 167 | 420 | 214 | 216 | 170 | 160 | 139 | 234 | 212 |
| 1945..... | 181 | 366 | 205 | 232 | 198 | 170 | 127 | 227 | 224 |
| 1946..... | 263 | 382 | 178 | 248 | 212 | 209 | 141 | 319 | 204 |
| 1947..... | 257 | 380 | 232 | 248 | 336 | 259 | 148 | 381 | 249 |
| 1948..... | 250 | 387 | 220 | 249 | 212 | 232 | 160 | 301 | 238 |
| 1949 | | | | | | | | | |
| August..... | 236 | 446 | 221 | 305 | 184 | 202 | 135 | 197 | 174 |
| September... | 240 | 487 | 198 | 263 | 181 | 212 | 137 | 193 | 205 |
| October..... | 231 | 474 | 187 | 224 | 170 | 214 | 141 | 185 | 170 |
| November... | 224 | 434 | 192 | 216 | 159 | 215 | 141 | 188 | 213 |
| December.... | 214 | 454 | 188 | 230 | 176 | 218 | 144 | 192 | 196 |
| 1950 | | | | | | | | | |
| January..... | 213 | 397 | 195 | 245 | 179 | 217 | 144 | 193 | 261 |
| February.... | 222 | 341 | 191 | 252 | 181 | 218 | 141 | 193 | 203 |
| March..... | 226 | 320 | 189 | 253 | 185 | 224 | 139 | 191 | 168 |
| April..... | 232 | ... | 192 | 260 | 196 | 227 | 140 | 197 | 205 |
| May..... | 236 | 485 | 184 | 260 | 209 | 231 | 145 | 200 | 178 |
| June..... | 241 | 497 | 182 | 240 | 212 | 218 | 135 | 205 | 182 |
| July..... | 267 | 455 | 182 | 237 | 224 | 225 | 127 | 231 | 200 |

## Wholesale Prices of Ammoniates

| | Nitrate of soda bulk per unit N | Sulphate of ammonia bulk per unit N | Cottonseed meal S. E. Mills per unit N | Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N | Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N | High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N |
|---|---|---|---|---|---|---|
| 1910–14 | $2.68 | $2.85 | $3.50 | $3.53 | $3.37 | $3.52 |
| 1925 | 3.11 | 2.47 | 5.41 | 5.34 | 3.97 | 4.75 |
| 1926 | 3.06 | 2.41 | 4.40 | 4.95 | 4.36 | 4.90 |
| 1927 | 3.01 | 2.26 | 5.07 | 5.87 | 4.32 | 5.70 |
| 1928 | 2.67 | 2.30 | 7.06 | 6.63 | 4.92 | 6.00 |
| 1929 | 2.57 | 2.04 | 5.64 | 5.00 | 4.61 | 5.72 |
| 1930 | 2.47 | 1.81 | 4.78 | 4.96 | 3.79 | 4.58 |
| 1931 | 2.34 | 1.46 | 3.10 | 3.95 | 2.11 | 2.46 |
| 1932 | 1.87 | 1.04 | 2.18 | 2.18 | 1.21 | 1.36 |
| 1933 | 1.52 | 1.12 | 2.95 | 2.86 | 2.06 | 2.46 |
| 1934 | 1.52 | 1.20 | 4.46 | 3.15 | 2.67 | 3.27 |
| 1935 | 1.47 | 1.15 | 4.59 | 3.10 | 3.06 | 3.65 |
| 1936 | 1.53 | 1.23 | 4.17 | 3.42 | 3.58 | 4.25 |
| 1937 | 1.63 | 1.32 | 4.91 | 4.66 | 4.04 | 4.80 |
| 1938 | 1.69 | 1.38 | 3.69 | 3.76 | 3.15 | 3.53 |
| 1939 | 1.69 | 1.35 | 4.02 | 4.41 | 3.87 | 3.90 |
| 1940 | 1.69 | 1.36 | 4.64 | 4.36 | 3.33 | 3.39 |
| 1941 | 1.69 | 1.41 | 5.50 | 5.32 | 3.76 | 4.43 |
| 1942 | 1.74 | 1.41 | 6.11 | 5.77 | 5.04 | 6.76 |
| 1943 | 1.75 | 1.42 | 6.30 | 5.77 | 4.86 | 6.62 |
| 1944 | 1.75 | 1.42 | 7.68 | 5.77 | 4.86 | 6.71 |
| 1945 | 1.75 | 1.42 | 7.81 | 5.77 | 4.86 | 6.71 |
| 1946 | 1.97 | 1.44 | 11.04 | 7.38 | 6.60 | 9.33 |
| 1947 | 2.50 | 1.60 | 12.72 | 10.66 | 12.63 | 10.46 |
| 1948 | 2.86 | 2.03 | 12.94 | 10.59 | 10.84 | 9.85 |
| 1949 | 3.15 | 2.29 | 10.11 | 13.18 | 10.73 | 10.62 |
| August | 3.19 | 2.32 | 11.88 | 14.49 | 12.75 | 12.14 |
| September | 3.19 | 2.32 | 9.83 | 14.53 | 11.53 | 11.53 |
| October | 3.08 | 2.32 | 9.94 | 14.58 | 11.29 | 11.65 |
| November | 3.00 | 2.32 | 10.39 | 14.21 | 10.39 | 10.78 |
| December | 3.00 | 2.32 | 12.94 | 13.88 | 9.87 | 9.94 |
| 1950 | | | | | | |
| January | 3.00 | 2.32 | 10.27 | 13.79 | 10.26 | 10.08 |
| February | 3.00 | 2.32 | 9.37 | 13.45 | 8.96 | 8.96 |
| March | 3.00 | 2.32 | 9.70 | 13.01 | 10.17 | 9.34 |
| April | 3.00 | 2.32 | 10.34 | 12.58 | 10.39 | 8.19 |
| May | 3.00 | 2.05 | 10.74 | 11.97 | 10.14 | 7.59 |
| June | 3.00 | 1.71 | 10.55 | 10.79 | 9.41 | 7.36 |
| July | 3.00 | 1.71 | 11.53 | 10.71 | 9.35 | 8.74 |
| | **Index Numbers (1910-14 = 100)** | | | | | |
| 1925 | 115 | 87 | 155 | 151 | 117 | 135 |
| 1926 | 113 | 84 | 126 | 140 | 129 | 139 |
| 1927 | 112 | 79 | 145 | 166 | 128 | 162 |
| 1928 | 100 | 81 | 202 | 188 | 146 | 170 |
| 1929 | 96 | 72 | 161 | 142 | 137 | 162 |
| 1930 | 92 | 64 | 137 | 141 | 112 | 130 |
| 1931 | 88 | 51 | 89 | 112 | 63 | 70 |
| 1932 | 71 | 36 | 62 | 62 | 36 | 39 |
| 1933 | 59 | 39 | 84 | 81 | 97 | 71 |
| 1934 | 59 | 42 | 127 | 89 | 79 | 93 |
| 1935 | 57 | 40 | 131 | 88 | 91 | 104 |
| 1936 | 59 | 43 | 119 | 97 | 106 | 131 |
| 1937 | 61 | 46 | 140 | 132 | 120 | 122 |
| 1938 | 63 | 48 | 105 | 106 | 93 | 100 |
| 1939 | 63 | 47 | 115 | 125 | 115 | 111 |
| 1940 | 63 | 48 | 133 | 124 | 99 | 96 |
| 1941 | 63 | 49 | 157 | 151 | 112 | 126 |
| 1942 | 65 | 49 | 175 | 163 | 150 | 192 |
| 1943 | 65 | 50 | 180 | 163 | 144 | 189 |
| 1944 | 65 | 50 | 219 | 163 | 144 | 191 |
| 1945 | 65 | 50 | 223 | 163 | 144 | 191 |
| 1946 | 74 | 51 | 315 | 209 | 196 | 265 |
| 1947 | 93 | 56 | 363 | 302 | 374 | 297 |
| 1948 | 107 | 71 | 370 | 300 | 322 | 280 |
| 1949 | 117 | 80 | 289 | 373 | 318 | 302 |
| August | 119 | 81 | 339 | 410 | 378 | 345 |
| September | 119 | 81 | 281 | 412 | 342 | 328 |
| October | 115 | 81 | 284 | 413 | 335 | 331 |
| November | 112 | 81 | 297 | 403 | 308 | 306 |
| December | 112 | 81 | 311 | 393 | 293 | 282 |
| 1950 | | | | | | |
| January | 112 | 81 | 293 | 391 | 304 | 286 |
| February | 112 | 81 | 268 | 381 | 266 | 255 |
| March | 112 | 81 | 277 | 369 | 302 | 265 |
| April | 112 | 81 | 295 | 356 | 308 | 233 |
| May | 112 | 72 | 307 | 339 | 301 | 216 |
| June | 112 | 60 | 301 | 306 | 279 | 209 |
| July | 112 | 60 | 329 | 303 | 277 | 248 |

## Wholesale Prices of Phosphates and Potash * *

| | Superphosphate, Baltimore, per unit | Florida land pebble, 68% f.o.b. mines, bulk, per ton | Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton | Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[2] | Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[2] | Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[2] | Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[2] |
|---|---|---|---|---|---|---|---|
| 1910–14 | $0.536 | $3.61 | $4.88 | $0.714 | $0.953 | $24.18 | $0.657 |
| 1925 | .600 | 2.44 | 6.16 | .584 | .860 | 23.72 | .483 |
| 1926 | .598 | 3.20 | 5.57 | .596 | .854 | 23.58 | .537 |
| 1927 | .525 | 3.09 | 5.50 | .646 | .924 | 25.55 | .586 |
| 1928 | .580 | 3.12 | 5.50 | .669 | .957 | 26.46 | .607 |
| 1929 | .609 | 3.18 | 5.50 | .672 | .962 | 26.59 | .610 |
| 1930 | .542 | 3.18 | 5.50 | .681 | .973 | 26.92 | .618 |
| 1931 | .485 | 3.18 | 5.50 | .681 | .973 | 26.92 | .618 |
| 1932 | .458 | 3.18 | 5.50 | .681 | .963 | 26.90 | .618 |
| 1933 | .434 | 3.11 | 5.50 | .662 | .864 | 25.10 | .601 |
| 1934 | .487 | 3.14 | 5.67 | .486 | .751 | 22.49 | .483 |
| 1935 | .492 | 3.30 | 5.69 | .415 | .684 | 21.44 | .444 |
| 1936 | .476 | 1.85 | 5.50 | .464 | .708 | 22.94 | .505 |
| 1937 | .510 | 1.85 | 5.50 | .508 | .757 | 24.70 | .556 |
| 1938 | .492 | 1.85 | 5.50 | .523 | .774 | 15.17 | .572 |
| 1939 | .478 | 1.90 | 5.50 | .521 | .751 | 24.52 | .570 |
| 1940 | .516 | 1.90 | 5.50 | .517 | .730 | 24.75 | .573 |
| 1941 | .547 | 1.94 | 5.64 | .522 | .780 | 25.55 | .367 |
| 1942 | .600 | 2.13 | 6.29 | .522 | .810 | 25.74 | .205 |
| 1943 | .631 | 2.00 | 5.93 | .522 | .786 | 25.35 | .195 |
| 1944 | .645 | 2.10 | 6.10 | .522 | .777 | 25.35 | .195 |
| 1945 | .650 | 2.20 | 6.23 | .522 | .777 | 25.35 | .195 |
| 1946 | .671 | 2.41 | 6.50 | .508 | .769 | 24.70 | .190 |
| 1947 | .746 | 3.05 | 6.60 | .432 | .706 | 18.93 | .195 |
| 1948 | .764 | 4.27 | 6.60 | .397 | .681 | 14.14 | .195 |
| 1949 | .770 | 3.88 | 6.22 | .397 | .703 | 14.14 | .195 |
| August | .770 | 3.60 | 5.47 | .353 | .679 | 13.63 | .188 |
| September | .770 | 3.65 | 5.47 | .353 | .679 | 13.63 | .188 |
| October | .770 | 3.75 | 5.47 | .375 | .720 | 14.50 | .200 |
| November | .770 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| December | .770 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| 1950 | | | | | | | |
| January | .762 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| February | .760 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| March | .760 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| April | .760 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| May | .760 | 3.76 | 5.47 | .375 | .720 | 14.50 | .200 |
| June | .760 | 3.76 | 5.47 | .336 | .647 | 12.77 | .176 |
| July | .760 | 3.76 | 5.47 | .368 | .704 | 13.98 | .193 |
| | **Index Numbers (1910-14 = 100)** | | | | | | |
| 1925 | 110 | 68 | 126 | 82 | 90 | 98 | 74 |
| 1926 | 112 | 88 | 114 | 83 | 90 | 98 | 82 |
| 1927 | 100 | 86 | 113 | 90 | 97 | 106 | 89 |
| 1928 | 108 | 86 | 113 | 94 | 100 | 109 | 92 |
| 1929 | 114 | 88 | 113 | 94 | 101 | 110 | 93 |
| 1930 | 101 | 88 | 113 | 95 | 102 | 111 | 94 |
| 1931 | 90 | 88 | 113 | 95 | 102 | 111 | 94 |
| 1932 | 85 | 88 | 113 | 95 | 101 | 111 | 94 |
| 1933 | 81 | 86 | 113 | 93 | 91 | 104 | 91 |
| 1934 | 91 | 87 | 110 | 68 | 79 | 93 | 74 |
| 1935 | 92 | 91 | 117 | 58 | 72 | 89 | 68 |
| 1936 | 89 | 51 | 113 | 65 | 74 | 95 | 77 |
| 1937 | 95 | 51 | 113 | 71 | 79 | 102 | 85 |
| 1938 | 92 | 51 | 113 | 73 | 81 | 104 | 87 |
| 1939 | 89 | 53 | 113 | 73 | 79 | 101 | 87 |
| 1940 | 96 | 53 | 113 | 72 | 77 | 102 | 87 |
| 1941 | 102 | 54 | 110 | 73 | 82 | 106 | 87 |
| 1942 | 112 | 59 | 129 | 73 | 85 | 106 | 84 |
| 1943 | 117 | 55 | 121 | 73 | 82 | 105 | 83 |
| 1944 | 120 | 58 | 125 | 73 | 82 | 105 | 83 |
| 1945 | 121 | 61 | 128 | 73 | 82 | 105 | 83 |
| 1946 | 125 | 67 | 133 | 71 | 81 | 102 | 82 |
| 1947 | 139 | 84 | 135 | 70 | 74 | 78 | 83 |
| 1948 | 143 | 118 | 135 | 67 | 72 | 58 | 83 |
| 1949 | 144 | 108 | 128 | 67 | 74 | 58 | 83 |
| August | 144 | 100 | 112 | 65 | 71 | 56 | 82 |
| September | 144 | 101 | 112 | 65 | 71 | 56 | 82 |
| October | 144 | 104 | 112 | 68 | 76 | 60 | 83 |
| November | 144 | 104 | 112 | 68 | 76 | 60 | 83 |
| December | 144 | 104 | 112 | 68 | 76 | 60 | 83 |
| 1950 | | | | | | | |
| January | 142 | 104 | 112 | 68 | 76 | 60 | 83 |
| February | 142 | 104 | 112 | 68 | 76 | 60 | 83 |
| March | 142 | 104 | 112 | 68 | 76 | 60 | 83 |
| April | 142 | 104 | 112 | 68 | 76 | 60 | 83 |
| May | 142 | 104 | 112 | 68 | 76 | 60 | 83 |
| June | 142 | 104 | 112 | 63 | 68 | 53 | 80 |
| July | 142 | 104 | 112 | 67 | 74 | 58 | 82 |

## Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

| | Farm prices* | Prices paid by farmers for commodities bought* | Wholesale prices of all commodities† | Fertilizer material‡ | Chemical ammoniates | Organic ammoniates | Superphosphate | Potash** |
|---|---|---|---|---|---|---|---|---|
| 1925..... | 156 | 153 | 151 | 112 | 100 | 131 | 109 | 80 |
| 1926..... | 146 | 150 | 146 | 119 | 94 | 135 | 112 | 86 |
| 1927..... | 141 | 148 | 139 | 116 | 89 | 150 | 100 | 94 |
| 1928..... | 149 | 152 | 141 | 121 | 87 | 177 | 108 | 97 |
| 1929..... | 148 | 150 | 139 | 114 | 79 | 146 | 114 | 97 |
| 1930..... | 125 | 140 | 126 | 105 | 72 | 131 | 101 | 99 |
| 1931..... | 87 | 119 | 107 | 83 | 62 | 83 | 90 | 99 |
| 1932..... | 65 | 102 | 95 | 71 | 46 | 48 | 85 | 99 |
| 1933..... | 70 | 104 | 96 | 70 | 45 | 71 | 81 | 95 |
| 1934..... | 90 | 118 | 109 | 72 | 47 | 90 | 91 | 72 |
| 1935..... | 109 | 123 | 117 | 70 | 45 | 97 | 92 | 63 |
| 1936..... | 114 | 123 | 118 | 73 | 47 | 107 | 89 | 69 |
| 1937..... | 122 | 130 | 126 | 81 | 50 | 129 | 95 | 75 |
| 1938..... | 97 | 122 | 115 | 78 | 52 | 101 | 92 | 77 |
| 1939..... | 95 | 121 | 112 | 79 | 51 | 119 | 89 | 77 |
| 1940..... | 100 | 122 | 115 | 80 | 52 | 114 | 96 | 77 |
| 1941..... | 123 | 130 | 127 | 86 | 56 | 130 | 102 | 77 |
| 1942..... | 158 | 149 | 144 | 93 | 57 | 161 | 112 | 77 |
| 1943..... | 192 | 165 | 151 | 94 | 57 | 160 | 117 | 77 |
| 1944..... | 196 | 174 | 152 | 96 | 57 | 174 | 120 | 76 |
| 1945..... | 206 | 180 | 154 | 97 | 57 | 175 | 121 | 76 |
| 1946..... | 234 | 197 | 177 | 107 | 62 | 240 | 125 | 75 |
| 1947..... | 275 | 231 | 222 | 130 | 74 | 362 | 139 | 72 |
| 1948..... | 285 | 250 | 241 | 134 | 89 | 314 | 143 | 70 |
| 1949 | | | | | | | | |
| August.... | 244 | 238 | 222 | 143 | 100 | 372 | 144 | 68 |
| September. | 247 | 238 | 225 | 138 | 100 | 334 | 144 | 68 |
| October... | 242 | 237 | 222 | 138 | 98 | 331 | 144 | 72 |
| November. | 237 | 236 | 221 | 136 | 96 | 321 | 144 | 72 |
| December.. | 233 | 237 | 221 | 136 | 96 | 317 | 144 | 72 |
| 1950 | | | | | | | | |
| January... | 235 | 238 | 221 | 135 | 96 | 316 | 142 | 72 |
| February.. | 237 | 237 | 223 | 132 | 96 | 286 | 142 | 72 |
| March.... | 237 | 239 | 223 | 134 | 96 | 305 | 142 | 72 |
| April..... | 241 | 240 | 223 | 135 | 96 | 313 | 142 | 72 |
| May..... | 247 | 244 | 228 | 132 | 91 | 311 | 142 | 72 |
| June..... | 247 | 245 | 230 | 126 | 85 | 293 | 142 | 66 |
| July..... | 263 | 247 | 236 | 128 | 85 | 301 | 142 | 70 |

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

**[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.**

**[2] All potash salts now quoted F.O.B. mines only: manure salts since June 1941, other carriers since June 1947.**

**** The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit $K_2O$ thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

# REVIEWS

**This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.**

## Fertilizers

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## 1949 Tomato Champions

(*From page* 22)

leaving about one plant every three feet in 40-inch rows. They were cultivated three times and hoed twice. First delivery to the factory was made on August 12.

Reserve champion of the State contest was Glen G. McCain of Howard county.

Clifford Bulach of Sunman, in southeastern Indiana, carried off the 1949 blue ribbon in the Double Tonnage Club with an average yield of 14.5 tons per acre. Young Bulach had never grown tomatoes before, but his father, Joseph Bulach, had been a repeating Double Tonnage winner, and Cliff used this "bank" of "tomato know-how."

The Bulach 1949 tomato field was well-drained clay loam. In 1946 eight tons of manure and 250 pounds of 3-12-12 per acre had been applied previous to planting corn. In 1947, before the wheat crop was planted, 300 pounds of 3-12-12 along with another topdressing of four tons of manure were applied. The wheat was seeded to clover which was cut for hay in 1948. Early in the spring of 1949, three tons of lime and ten tons of manure per acre were applied.

Before plowing in late April, 1,200 pounds of 3-12-12 fertilizer per acre were applied. The field was disced and harrowed three times and 300 pounds of 3-12-12 were applied in the row. Tennessee plants (Rutgers) were set on June 2 and 3, thirty inches apart in the row. It began raining a week after the plants were set and by replanting several times, a 100 per cent stand was obtained. Due to wet weather continuing, it was the last week in June before they were cultivated for the first time. This was followed the first week in July by hand hoeing, and a week later they were gone through with a one-horse cultivator. The tomatoes were picked once a week from August 9 until September 29.

# Some Recent Books

THE CHEMICAL FORMULARY, Vol. VIII, Edited by H. Bennett (Chemical Publishing Company, Inc., Brooklyn, New York, 1948. $7.00). If you want to prepare or mix up any kind of soap, ink, polish, insecticide, weed killer, paint, glue, lipstick, tooth paste, wart remover, chicken feed, baking powder, leather belt dressing, welding flux, and many other products ranging from diamond dust abrasive to zein dispersion, you probably will find it explained in the Chemical Formulary. It is designed for industrial and home use and gives careful directions on kinds and amounts of ingredients and methods of preparation. A valuable list of over 1,200 firms and laboratories that can supply the chemical ingredients, conversion tables, and a good index add to the value of this volume in a well-known series.

FUNDAMENTALS OF SOIL SCIENCE, by C. E. Millar and L. M. Turk (John Wiley & Sons Inc., New York, 1943. $3.50). A textbook which covers the origin, formation, properties of soils and their management, and lime and fertilizer production and use. A practical approach is used by the authors and this broad field is covered clearly and concisely. Technicalities are not avoided but are reduced to a minimum and clearly explained. While this is written primarily as a textbook, it is well indexed and can serve as an excellent reference.

COMMERCIAL FERTILIZERS, by Gilbeart H. Collings (Blakiston Company, Philadelphia, Pa., 4th Edition, 1947. $4.50). This new edition of Commercial Fertilizers follows the same arrangement and form of the previous edition. New data and references have been added, and the section on ammonium nitrate fertilizers has been expanded to a full chapter, reflecting the increased importance of this fertilizer material in American agriculture. The sources, production methods, and usage of fertilizer materials found on the market including many of minor importance are discussed. Attention is given to the secondary and minor as well as the major nutrients. Chapters are devoted to fertilizer purchase, usage including mixing of fertilizer and methods for determining fertilizer requirements, and fertilizer application methods. This is the most widely-used book on fertilizers in the country and the frequent revisions keep it up to date. It is excellent as a reference as well as a textbook.

## Boron Improved Meadow

(*From page* 18)

problem. Reynolds took his problem to Richman in July and after a walk over the fields, Richman strongly suspected a boron shortage.

The alfalfa was stunted, dry, sparsely-leaved, and rosetted, or bushy-topped. Some of the tops were yellow; some were reddish. The internodes, or spaces between joints where the roots and leaf stems emerge, on the ladino runners were short, indicating slow growth. Root growth was lacking and leaves on the older nodes were drying up. The symptoms showed up most during the dry periods of the summer.

Since all the symptoms pointed to a boron deficiency, which he had seen in other parts of the county, Richman suggested that Reynolds try about 20 pounds of borax on some acres in the meadow. In August, they broadcast the borax, plus 300 pounds of 0-15-15 per acre, on all except one acre in a 12-acre meadow. That one acre received only the 0-15-15. On another meadow, they covered only one acre with borax alone.

"I was astonished at the results,"

Reynolds exclaimed in October. "And the doggone stuff is so cheap. I paid only $4.35 a hundred for it. After seeing what it did to those fields, I covered 50 more acres with it."

The difference between the treated and untreated fields was the difference between day and night. In early October the untreated acres, along with the acre that received only the 0-15-15, were a dead brown of "poverty grass" and alfalfa stems.

But on the treated acres, the ladino was a lush green carpet. "It was even creeping out into the quackgrass at the edge of the field and killing it," Reynolds said. The treated alfalfa was a juicy green and full-leaved, a sharp contrast to the dry, stunted, stemmy growth on the untreated fields.

Richman suggested broadcasting rather than drilling because borax kills seeds it comes in contact with. He said broadcasting over meadow at rates up to 50 pounds, and in some cases more, has been found to be safe. Overdosing, however, can kill all the vegetation in a field.

He observes that similar symptoms have been cropping up increasingly often in northeastern Indiana. They show up particularly on sandy, droughty soils that are hard hit in dry periods; but also show up on heavier soils, such as the silty clay loam on Reynolds' farm. Alkaline soils are also more subject to the deficiency.

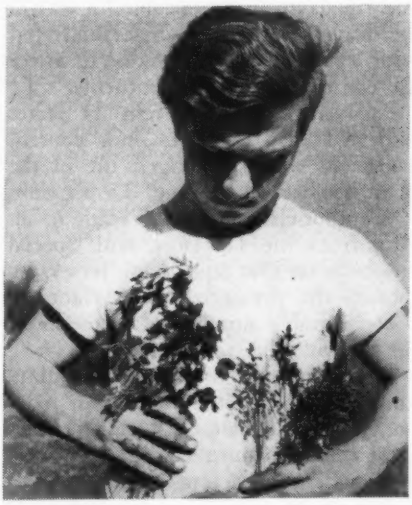

**Fig. 2. Reynold's nephew, Hugh, Jr., holds some treated and untreated alfalfa against his shirt to show the difference borax made in the same 1947 seeding.**

## Alfalfa—Its Mineral Requirements

(*From page* 12)

Borax, though highly necessary in alfalfa production in many parts of New Jersey, did not increase yields materially, since the soil was relatively high in this element at the start of the test.

One of the highest-yielding plots received five times the standard application of fertilizer or 300 pounds each of $K_2O$ and $P_2O_5$, at seeding time, and none afterward.

Some confirmation of the concept that the exchange complex of the ideal soil for alfalfa should contain about 65 per cent calcium, 10 per cent magnesium, 5 per cent potassium, and 20 per cent hydrogen was obtained. Such a soil would have a pH value of about 6.5.

The principle of the tendency toward cation constancy was further developed to include anions and the still greater constancy of the cation-anion ratios.

The following critical levels are suggested for alfalfa plants: 1.4 per cent potassium, 0.27 per cent phosphorus, 10 ppm. manganese, and 20 ppm. boron.

Critical levels suggested for alfalfa soils are: 80 pounds exchangeable potas-

sium in the plowed acre, a pH value below 6.5, and a water-soluble boron content below 0.35 ppm.

Proximate analyses of alfalfa indicated an increase in sugars, dextrins, and fat-like materials with increased potassium applications.

More than 80 per cent of the carotene and riboflavin in Ranger alfalfa was in the leaves. Anything that interfered with leaf development tended to lower the content of these constituents.

Analysis of alfalfa from 11 states indicated that the potassium content associated with the longest life of the plant lies between 1.5 and 2.5 per cent.

A minor-element survey made of alfalfa from the 11 states, with special emphasis on that from New Jersey, indicated the presence in the plants of a considerable number of elements of no known value to them.

Small amounts of nickel, strontium, and lead, in addition to boron, manganese, iron, cobalt, and molybdenum, were found in most samples.

Vanadium was found only in New Jersey alfalfa.

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# Trends in Soil Management in Peach Orchards

(*From page* 17)

good crops on soils with pH's ranging from 4.5 to 7.0. The optimum pH for this crop has never been determined, and it probably varies with soil type and other environmental conditions. There is evidence accumulating, however, which indicates that sandy peach soils should be maintained at a lower pH than has usually been recommended in recent years. Certain minor elements may be inactivated as the pH approaches 7.0. If too much lime is applied, either in one application or in regular annual applications, some of these nutrient elements may become unavailable to peach trees. A case of manganese deficiency, apparently induced by overliming, was found in a New Jersey peach orchard during the past summer. The soil in this orchard ranged from 6.0 to 7.0 down to the three-foot level.

Zinc deficiency, which may also be induced by overliming, has been a limiting factor in both Florida and California peach orchards for many years. During recent years, cases of zinc deficiency have been found in peach and apple orchards in at least three states of the eastern Coastal Plain.

Cases of boron deficiency in northeastern apple orchards have been known for 10 or more years. The symptoms are not nearly as clear-cut in the peach as are the symptoms for some of the other nutrients. It is usually first evidenced as a dying-back of terminal twigs, very much like Oriental fruit moth injury. In fact, these two injuries are so similar that one can be mistaken for the other on peach trees. Low boron often limits crop production without showing any definite "hunger sign." The only symptom which it may produce is "reduced yield," and this often is attributed to a multitude of sins other than boron deficiency. New Jersey and several other Coastal Plain states are conducting field experiments with borax on peaches. More information concerning its needs by this fruit should be forthcoming in the near future.

Iron deficiency in peaches has usually been limited to alkaline regions, such as are found in areas of Colorado and California. It is difficult to correct. Capsules containing iron citrate have been placed in holes in the trunks of peach trees with satisfactory results, and nutritional sprays have been used in some cases.

Copper and molybdenum are two essential elements which have not, to date, been known to be limiting in peach production in the United States. Field tests with these elements are now under way in several New Jersey peach orchards.

Most of the minor elements can be furnished to peach trees through foliar sprays. Such sprays, however, often need to be repeated three or four times during the growing season if satisfactory response is to be maintained. The use of urea sprays as a source of nitrogen for peach trees is still in the experimental stage. New Jersey, as well as other states, has an experimental program under way with this material on peach trees.

Whenever possible, nutrient elements should be applied through soil fertilization. In some soils, though, especially in alkaline regions, some nutrients become unavailable almost as quickly as they are applied. When such conditions are present, foliar sprays or capsule injection into tree trunks may be the only way in which trees can obtain proper nutrition.

## Our America

(*From page* 5)

or the silk parasol, or the derby hat. Travel abroad was only for a few of the richest, or for a colony of art students or literary hacks. Country folks went to town once a week or less often and relied on themselves for pleasures and pastimes. Urban dwellers were fresh from the country, too, and seldom bothered much about kings and conquests and tripartite agreements. Life was local.

MEANWHILE this national tree of ours became a veritable Sequoia of the Redwood variety. Its roots plunged through the rock of time and its sheltering branches swung far out above the surrounding seas of our continent.

From its brace roots sprang up a myriad of new industries arising from new inventions. Many of the inventions were hatched abroad and got the capital to develop them in America. In our youth, the airplane and the electric dynamo set the stage for world adventure, while the farms were gradually supplied with tractor-powered implements and bolder and more vigorous organizations to match the organizations built up by industry and commerce. We got tariff-minded and foreign-investment-minded at the same time and we pull-hauled both ways and saw the world getting smaller and our nation looming larger. So the quiet days of our youth in the early 1900's vanished too soon for us, and distant booming of the guns in France called us to the colors again. I often think back to that summer of 1914, and so do you who lived it with me. It was the end of an era of isolation.

Mark you, I do not say it ended "isolationism." The nation had one charted and necessary course to follow as best it might in a world made smaller by science; but individuals differed much about this new thing that was happening to their America.

I for one am not going to scorn them or say unkind words about my Midwest friends and others elsewhere who honestly believed that President Washington meant to lay down a lasting motto when he spoke about "entangling alliances abroad." But it took as long to hear from England in his day as it took to grow a good crop of tobacco, and there was a century of toil ahead of us before we even connected the eastern seaboard with the Golden Gate. When we did just that; when we came to the end of the continent and the limits of our physical endeavor were found to exist in a new realm of science and expanding mass power rather than in acquiring more land, it was then that we had to hitch up with the rest of the universe or else stagnate.

SO THE offspring of those two once-youthful zealots of Bavaria and Vermont, like the kindred of countless more, had to face a complex and varied and shifting picture. What was once the household vine and fig tree of scriptural reverence had loomed up like Jack's fabulous beanstalk, always demanding to be fertilized and nourished lest it crash down and carry with it all the hopes of the spirit that planted it.

What has happened to America is without parallel in the world's history. But it is not enough to claim that the strength and the vigor of that mighty tree are caused by mass power or mechanical skill or armed might. My father and my wife's grandpa used some armed might—such as it was—and so did their offspring, but it had no pleasant flavor to their taste and they quickly spewed it out to quench their thirst on the real spring of human hope—a decent regard for others and the ways of peace.

It seems that the thing that bothers us most nowadays is being misunder-

stood. Other smaller saplings look up at our great trunk and mighty branches and imagine we are a parasite and a deceiver. Lots of big men are envied and feared unjustly, regardless of how kind-hearted and well-intentioned they may really be.

WHAT with outright liars and those who don't know for sure, we are surrounded in too many places in the world by envious and fearful neighbors. In spite of all we can do in lending them some of our native fertility which is useful, if well used, to grow as equally big trees as ours, we often fail to supply them with the spirit of good will toward man that has usually marked our growth.

I don't know any more about what attitude the aforesaid ancestors of ours would hold about this matter than I know about the way General Washington would react. My father and her grandpa were pretty much of the original American, of course; and they probably would be aghast at the money and credit we have been pouring into the world's development and protection. But they had to live their own lives and we have to live ours just as boldly. Yet I can almost bet on a certainty that her grandpa and my dad would favor any attempt to let other less favored nations in on some of the good fortune and happiness that only come with the dignity of man and the right of free self-government.

I don't think they would insist to the last jot and tittle on using and enforcing the American brand of republic everywhere to gain those desirable goals. It's a pretty good pattern, however, if you rub out some of the brutality and the drabness here and there which comes from making such a quick growth. Underneath you'll usually find that these Americans are sentimental to a fault and always ready to help a friend in need or rescue some individual from danger. I've done just a little traipsing abroad, and most of the folks I met would also make excel-


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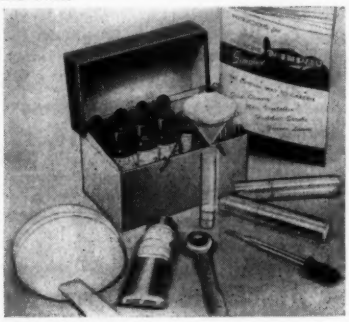

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lent citizens of a republic that upheld human dignity and free self-government.

We can all recall that when we were little folks the thing that impressed us a lot was the friendly tone between the citizens of our community. My father was a poor man, but he suffered none in his personal reputation or dignity from a lean purse. The head banker and the mayor and the biggest merchant always spoke kindly to him and respected his opinion. They would stop and ask him about the family and listen to his ideas about what needed to be done around the town; and he was a speaker on "patriotism" appointed by the school board to lead exercises on Decoration Day. It wasn't clothes or bank accounts or pedigrees that counted as America was growing up. Come to think of it, it isn't much different today when you get right out where the real citizens live.

The real test is decency and honesty.

BUT our greatest hazard is our lack of interest in voting. When only 52 per cent of the qualified voters help decide who is to run this republic for good or ill, as happened in 1948, then we had better knuckle down and start some home missionary work. Maybe some of us need it worse than the Europeans. Even in Korea last year 85 per cent of those who were qualified cast their ballots.

It seems to be as hard to get people to the polls regularly as it is to cut down the casualties on the holidays. That's surely part and parcel of our dignity just as it is the foundation of free self-government.

All our young men have to register for the draft. Maybe we should ask for a compulsory registration for the ballot. Maybe we should tax a fellow for *not* voting, instead of taxing him for doing it. Yet just the minute you talk about compelling somebody to do something in public affairs, you run right up against the theory of a true democracy—which is to have folks

want to do things right themselves.

We can be thankful that aside from that bad voting record, we are doing pretty well as humble citizens to reflect the value of life in a great free nation. Sure, we have made lots of mistakes and men in charge of events have blundered and had better hindsight than foresight.

The main thing is not to lose sight of the reasons why our tree stands up so tall in the world's forest. And then to rally around and keep the hoot owls out of it and the bark disease and chewing bugs away from it—so that when we saw off a log from it to send abroad it won't be full of worm holes or too green and sappy to build with. Paul Bunyan and his tremendous crew of loggers and foresters are long gone to limbo, but it's his magic and his good humor and pep that hold us to the line, let the chips fall where they may.

Foreigners often fail to grasp these fairy tales and traditions, or do not understand our way of cussing and making light of things we respect the most. For America is young and its family tree shelters people who like to be jolly and agreeable and friendly, who extend their hands to grasp the foreign visitor in welcome, and who want lots of other nationalities to grow trees of their own to have a picnic under. But if the clouds come up over that picnic place, these hearty Americans can get busy in a jiffy, lest the flood waters drown the hopes of those who believe in the dignity of man and the right of free self-government.

---

"Where are you going, my pretty maid? Why do you pass me by?"

"I'm on my way to gymnathtic thcool," she lithped as she heaved a thigh."

* * *

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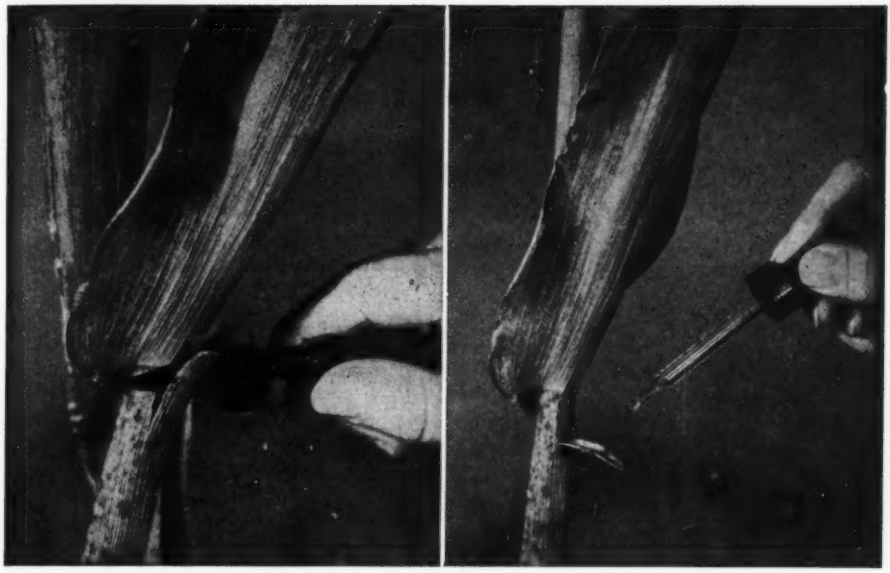

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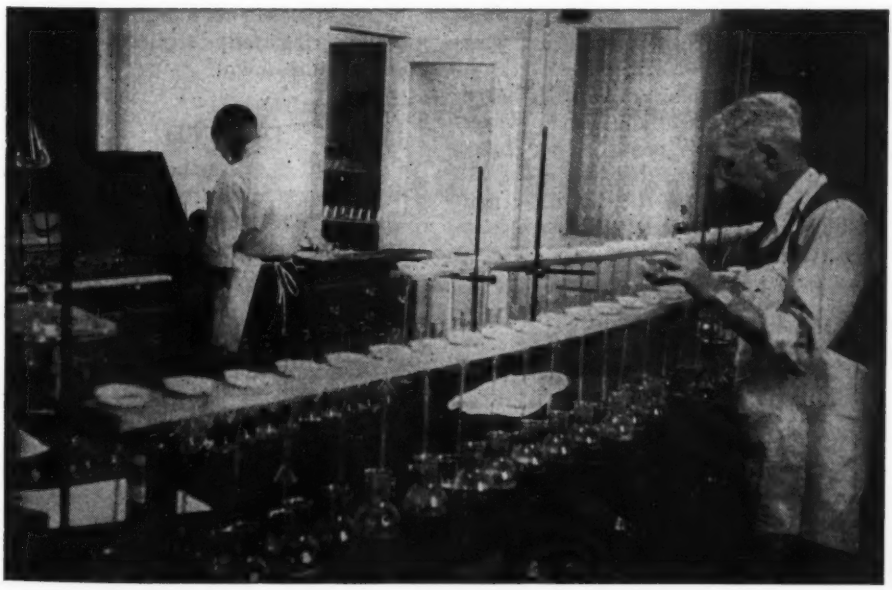

Equipment used in a well-developed laboratory for soil analyses.

It was the first vaudeville performance the old woman had ever seen and she was particularly excited over the feats of the magician. But when he covered a newspaper with a heavy flannel cloth and read the print through it she grew a little nervous. He then doubled the cloth and again read the letters accurately.

This was more than she could stand and, rising in her seat, she said: "I'm goin' home. This ain't no place for a lady in a thin calico dress!"

* * *

YEAH, USE YOUR NOODLE!

The stranger ambled into the farmyard and was greeted by the farmer. The visitor produced his card and remarked: "I am a government inspector and am entitled to inspect your farm."

Half an hour later, the farmer heard screams from his alfalfa patch, where the inspector was being chased by a bull. Leaning over the gate as the inspector drew near, the farmer cried: "Show him your card, mister—show him your card!"

* * *

"I've got my husband where he eats out of my hand."

"Saves a lot of dishwashing, doesn't it?"

* * *

GOOD DEAL

"So you got a divorce, Mandy. Did you get any alimony from your husband?"

"No, but he done gimme a fust class reference."

A newcomer to the town was looking for a church to attend. He happened into a small one in which the congregation was reading with the minister. They were saying: "We have left undone those things we ought to have done, and we have done those things which we ought not to have done."

The man dropped into a seat and sighed with relief as he said to himself: "Thank goodness, I've found my crowd at last."

* * *

A nine-year-old girl back from a birthday party told her mother that the boys had all huddled together and ignored the girls. "But I got one of them to pay attention to me, all right," she added.

"How?" asked her mother.

The young lady replied, "I just knocked him down."

* * *

DEFINED

Politician: "I'm for the greatest good to the greatest number."

Ditto: "And what is the greatest number?"

Politician: "Number one."

* * *

"How are you getting on with your new boy friend?" asked the brunette.

"Oh, he's all washed up," replied the blonde. "I think he's been deceiving me and that he's really a married man."

"Do you, dear? Whatever makes you think that?"

"Well, last night I was sitting on his knee and he gave me his watch to play with."

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